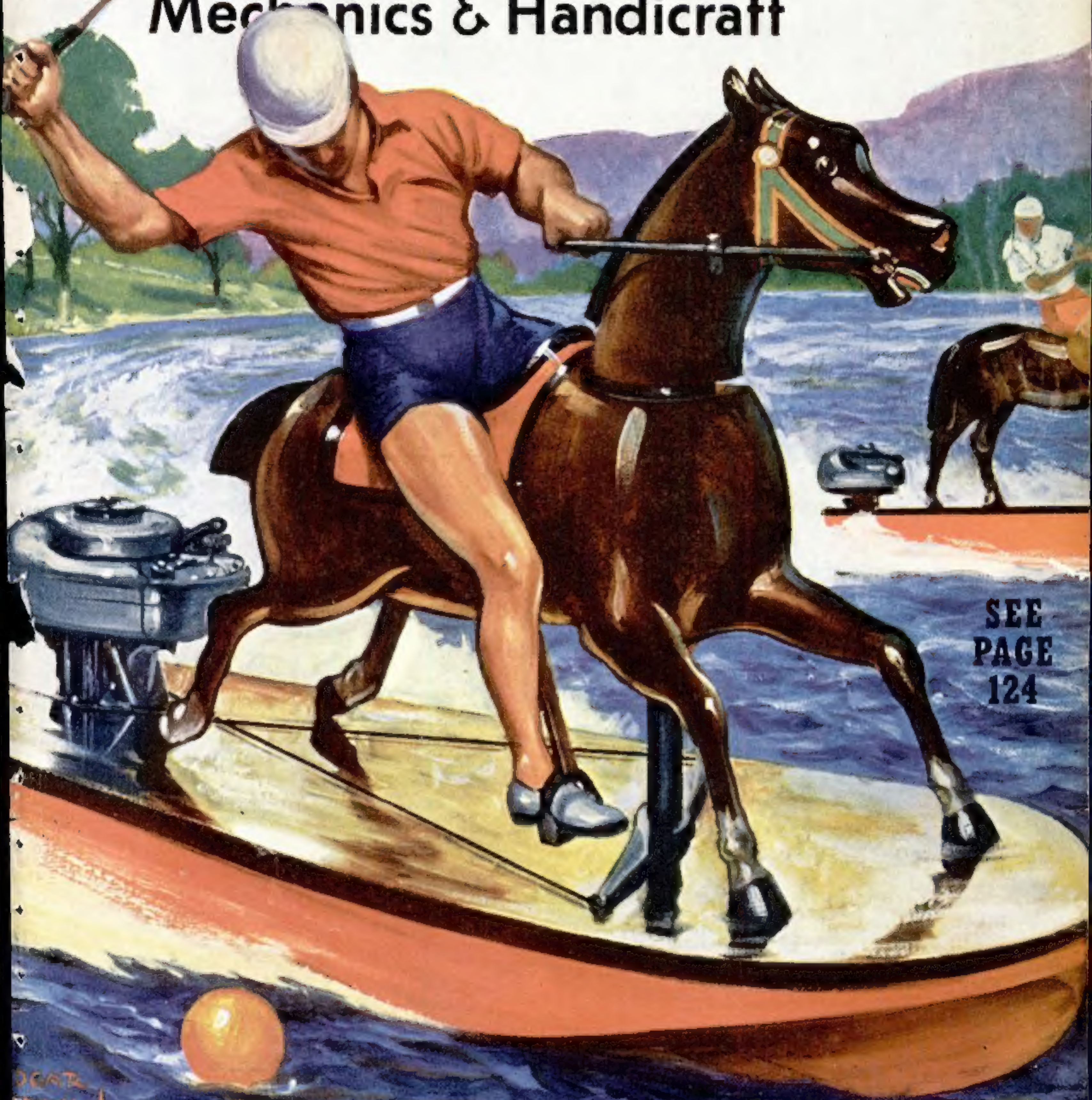


# POPULAR SCIENCE

MONTHLY

Mechanics & Handicraft

*June*  
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# POPULAR SCIENCE

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Mechanics & Handicraft

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## WHERE DO YOU GO FROM HERE?

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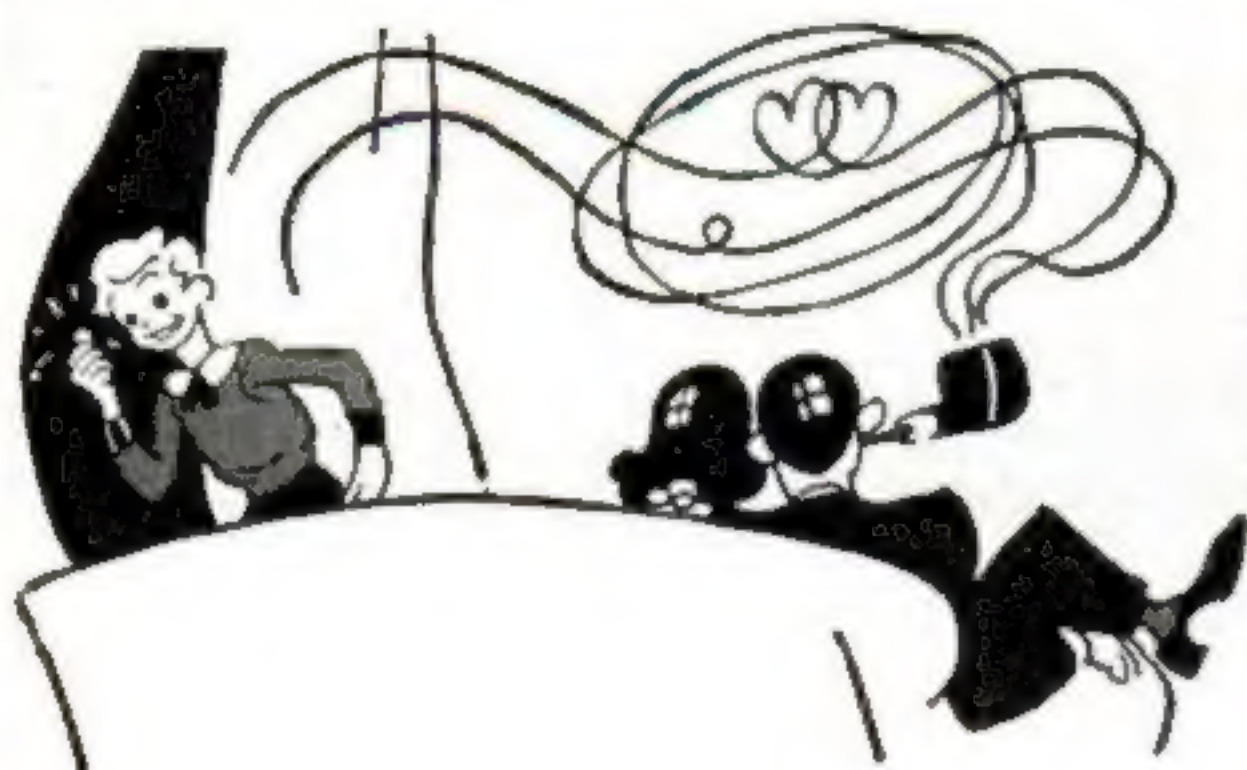
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# You Ask Me What I Am Doing?



## I Am Getting Ready to Earn More Money ... Preparing for a Bigger Job

I am a student of the American School, Chicago. A little more than half way through my course—already my increased knowledge has brought me promotion as a result of the hour or so a day I have been spending getting acquainted with the principles of the work I enjoy. I use only part of my spare time, so it doesn't interfere with my home and social life, and certainly helps me on the job.

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- ☐ Electrical Engineering
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- ☐ Drafting and Designing
- ☐ Electric Refrigeration
- ☐ Heating, Ventilating, Plumbing
- ☐ Professional Accounting Incl. C. P. A. Coaching
- ☐ High School
- ☐ Highway Engineering

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- ☐ Liberal Arts (College)
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## STORY OF A ONE-MAN HOUSE

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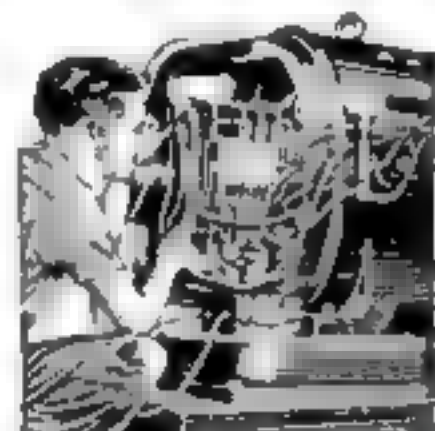
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# Our Readers Say



## Well, Now That You Speak of It, Maybe We'll Try It

EVERYBODY'S heard of messages being sealed up in bottles and set adrift on the ocean, to be found thousands of miles away and long afterwards. Well, a friend and I thought up a new

AT LAST, A MAN'S ADDRESS!



angle. We filled several rubber balloons (costing six cents) with some hydrogen which we generated at home from the action of acid on zinc. We tied the balloons together and hung a waterproof postal card beneath them, then set the balloons and their cargo free. They were picked up by a fellow in Crabbottom, Va., 600

miles away, who returned the postal card to us. We got a big kick out of the silly business! What's more, we can't think of anyone who wouldn't have! Get several gas-filled balloons, tie the necks together loosely, and attach a postal card treated with waterproof varnish. Why don't you try it?—R.H., Peoria, Ill.

## The Subject of Focusing Has Him Seeing Double

MAYBE some reader can throw light on a matter that's got me seeing double. Just what is eye focusing? Look at a pencil a few inches away from you. Then look beyond it to a picture on a wall. Something has obviously happened to your eyes. You've moved them to line up with a new parallax, or angle between one eye, the point being looked at, and the other eye. But is this really focusing, in the

WHAT'S ALL THIS ABOUT EYE FOCUSING?



optical sense? Isn't there an additional physical adjustment when the eyes look upon a more distant focal plane, just as there is with cameras, telescopes, microscopes, and other optical devices? And I'm not referring to the change in diameter of the eye iris, that compensates for light intensity. Another way of putting my problem

is this: Is the human-eye lens of the fixed-focus type, with a hyperfocal range from zero to infinity? It doesn't seem possible, or at all necessary, that it should be. Can one of your readers give me a short, nontechnical explanation?—P.R., Washington, N. J.

## They Have Another Virtue—You Get Them for Nothing

THAT article, "Flying Cameras Map America for War," in your May issue, certainly rang the bell with me. I'm a sucker for maps, anyway—just like to look at them. And that brings me to my reason for writing this letter—a hint I'd like to pass along to other readers who may share my enthusiasm for cartography. I have made a collection of the best automobile road maps—the kind you get at filling stations—for all the states of the Union. I find them much better than atlas maps for looking up places that figure in current events or in my historical reading. They are much larger than any maps found in books, and show topographical details much better. That's another blessing for which we can thank the automobile. —J.R.O., Buffalo, N. Y.

## Maybe Einstein Uses a "Four-Dimensional" Language

YOUR magazine is tops with me because of the way it takes scientific topics and projects and makes them accessible and understandable to the layman. It would be tragic if the

layman were forced to gather all his scientific knowledge by deciphering the language of the scientist of today. Even the average college professor cannot fully comprehend the following words of Einstein: "The empirical quantum of the gravitational equation bridges the corpuscles of the material es-

WHO CARES, AS LONG AS IT SOUNDS GOOD?



chatology by subliminal energy evolved counterclockwise out of analogous infinities." More power to the editor!—S.A.S., Moorhead, Minn.

## That Tire-Inflating Theory Just Doesn't Hold Water

IT SEEMS to me that W.R.S. has forgotten the main purpose of pneumatic tires when he suggests that water be used to inflate them. The limited elasticity of water would defeat this purpose. Just to show you, one cubic foot of water at a pressure of 375 pounds a square inch is reduced in bulk to .99999475 cubic feet. Air under the same pres- (Continued on page 14)



# THOUSANDS MARVEL TO SEE THEIR SKINNY BODIES FILL OUT...

## *As Wonderful IRONIZED YEAST Tablets Add 10 to 25 Pounds in a Few Weeks*

**SCIENTISTS** have discovered that thousands of people are thin and rundown only because they don't get enough Vitamin B and iron from their daily food. Without these vital substances you may lack appetite and not get the most body-building good out of what you eat.

Once these substances are supplied—and you get them now in these amazing little Ironized Yeast tablets—the improvement that comes in a short time is often astonishing. Thousands report wonderful new pep, gains of 10 to 25 pounds in a few weeks—complexions naturally clear—a new natural attractiveness that wins friends everywhere.

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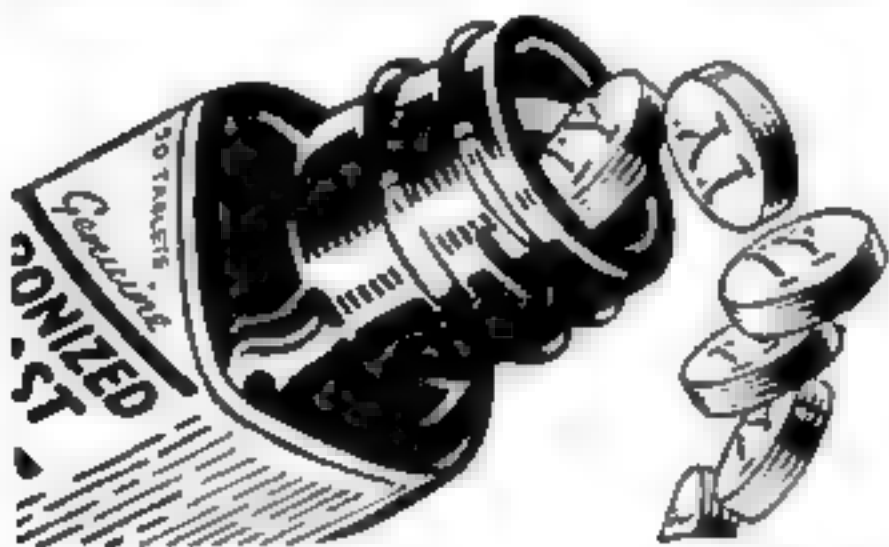
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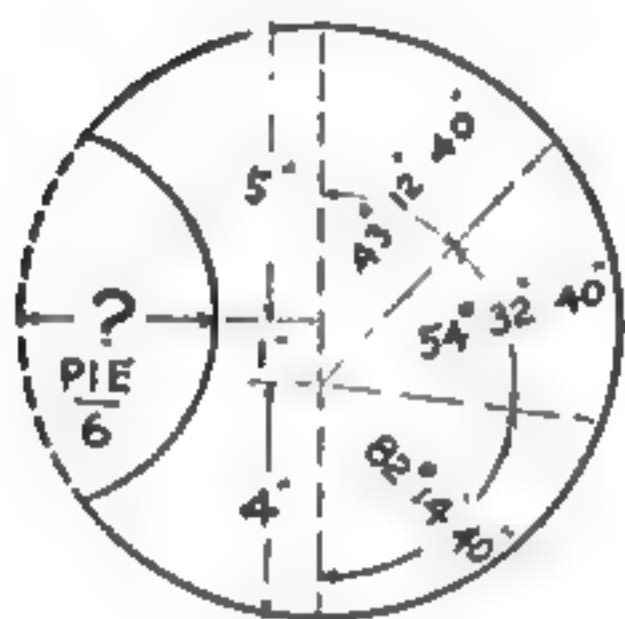


# Our Readers Say (CONTINUED)

sure is reduced to .04 cubic feet. Besides this, water would tend to rot the inner tubes, there would be danger of freezing, and heat generated by traveling would be dangerous. Finally, take proper care of the modern, air-filled tires and they won't blow out anyway!—R.E.McC., Honey Grove, Tex.

## This Fellow Had His Pie And Ate It, Too

THIS is a tale of what some bumpkin did to my pumpkin. One night a couple of friends were in my dining room helping me to cut up half of a pumpkin pie, according to L.P.B.'s directions in the April issue. Some guy with a wide-



angle mouth sneaked into the kitchen and bit a circular hunk out of the edge of the other half. After some figuring, we found that he had bitten out just one-third of that half pie. I pose this for members of the Pi Eta fraternity: What is the distance between his front teeth and his tonsils? In answer to the April problem, the three pieces of

pie of equal cubic content are found to be cut with angles of 82 degrees, 14 minutes, 40 seconds; 54 degrees, 32 minutes, 40 seconds; and 43 degrees, 12 minutes, 40 seconds.—S.A.M., Sykesville, Md.

## "Season" Saving, Like Daylight Saving, Was Old Stuff to the Druids

READER A.K.P., of Buffalo, who is annoyed four times a year when a new season starts with either a solstice or equinox instead of when the weather begins to change, is really advocating a return to the calendar of the druids. The names of the quarter days, Hallowmas, Candlemas, Beltane, and Lammas, persist in Great Britain, and the celebration of some of them persists in our folklore. The day before Hallowmas, for example, is our Halloween. Cheer up, A.K.P. If a groundhog or anybody else can really detect spring beginning in Buffalo on the first day of February, it, or he, as the case may be, is an irrepressible optimist. By the way, I've a friend who thinks that those sections of the country that now have daylight-saving time will eventually come to realize what he says are its "many advantages," and that they will

WHO SAYS I CAN'T TELL WHEN SPRING IS HERE?

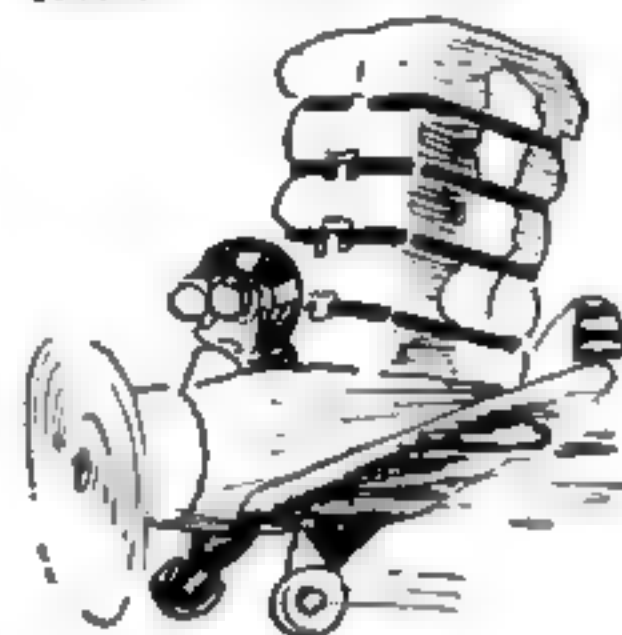


then pass laws making it a year-round custom. I leave it to your readers to decide if they want to get to their offices in winter before sunrise.—O.B.J., Ann Arbor, Mich.

## Quick Watson—The Antiaircraft Spray Gun!

THE subscriber who suggested that artificial fog and smoke screens be created in emergencies to prevent air raids by enemy bombers was on the right track, if I'm not mistaken. Here's another idea: It may sound strange, but don't you think a "smoke screen" of finely sprayed cotton fluff would stop an airplane's engine? That is, couldn't defensive planes whisk through the air in front of invading bombers, spraying some such stuff in their paths to clog up intakes, bearings, cooling systems, and so on? Silly or not, if these thoughts inspire even the faintest nucleus of a successful way to prevent air raids, and so perhaps prevent wars, I'll be the proudest man in the world.—G.D., Passaic, N. J.

HOW THE HECK AM I GONNA SPRAY THIS?



## Money Never Did Worry Gus—That's Joe Clark's Department

UNLESS he has some secret, low-price source of supply, I am afraid our old friend Gus Wilson was a bit optimistic on the price of the fluid ounce of mercury used in his recently described motor tester. The best price I was able to obtain was around one dollar and fifty cents. But then, Gus always has been able to find some inexpensive solution to most of his problems, so maybe he's found cheap mercury, too. Regardless, though, I think that particular story was swell and I hope Martin Bunn will give us more like it. Here's for more service stations like the Model Garage and more mechanics like our good old friend Gus Wilson.—E.T.L., Newark, N. J.

AH, FAN MAIL!



## Reader Unraveled the Roll-of-Tape Problem

THE roll-of-tape problem submitted by H.S.H. in the March issue is rather simple and involves an easy algebraic expression. The length of the tape times the tape thickness equals the area of the rolled tape, (*Continued on page 16*)



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JUNE, 1939

15



# Our Readers Say (CONTINUED)

assuming that the roll is a true cylinder in shape. After the operations are completed, the following facts come to light: The original diameter of the roll was 19.47 inches. There are thirty days left to finish the roll, with a hang-over of 25.5 inches on the thirty-first day.—E.G.W., Berlin, N. H.

## In Other Words, He Was Mixed Up on His Metaphor

"PHOTOGRAPHY has become a sort of Esperanto, replacing the English language," declares A.E., of Brooklyn, N. Y. I fear he doesn't understand the fundamental idea of Esperanto, the international language. Esperanto was never intended to replace English or any other language. It's an auxiliary language providing a common ground of understanding between peoples who speak different languages. Learn it in addition to your own language, not in place of it. Certainly, mutual linguistic understanding among peoples of all the world is a great force toward world peace. Please believe me that Esperanto is in all respects a neutral language, with no nationalistic connotations whatsoever. That is only one of the reasons why we Esperantists are so enthusiastic in urging its wide use.—W.B., Cambridge, Mass.

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can see the ground a lot better from in here than you can through those old windows!"—M.A.B., Dodge City, Kans.

## Anyone Got Plans for Making a Miniature Camera?

IT PLEASES me very much to know that P.S.M. takes a great interest in the many phases of photography, such as the cut-film adapter for roll-film cameras, in a recent issue, and many other useful photographic devices. I'm quite sure other readers besides myself would like to see an article on making an inexpensive miniature camera. How's chances?—K.L.H., New York City.

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## Article on Fixing Microscopes Got Him out of a Fix

THE article, "Reconditioning an Old Microscope," could not have been published at a more appropriate time for me, as I have purchased an old, old microscope from a friend. It was made in 1876, and I've never seen anything like it before. It has a double eyepiece, a mechanical stage, and so many other features that it would take a whole page to describe its complex structure. Now it will be much easier for me to fix it. Many thanks for the timely article.—T.B.R., Paterson, N. J.

## Bored "Air-Line Commuter" Is Taken for a Ride

It's just too bad about D.M., of New York City, who gets so bored when he rides in a plane that he wants a portable radio to listen to. I suppose that if he stood on the edge of the Grand Canyon he would wish for a portable television set so he could watch somebody do the shag. If airplane passengers weren't so anxious to look sophisticated and make each other believe that they have spent all their lives in the air, they might find it mildly interesting to watch the operation of the plane, the ground lying so far below them, and the beauty of the sky and clouds. Of course, I'm just a simple country boy, not an "air-line commuter." I've made only one trip in a plane, but that time I managed to pass the time all right, without a dull moment. It reminded me of the story about the little boy who went on a plane trip with his mother. For the first hour or two he sat with his nose pressed against the window, looking out. Finally he had to tear himself away to go to the lavatory at the back of the plane. When a half hour passed and he hadn't come back, his mother went to look for him. As she opened the door he exclaimed to her: "Gee, Mom, you

## Aussie Wants Follow-Ups on Those Engineering Projects

ALTHOUGH it is hard to suggest any improvements to make on your fine magazine, I do feel that there is one thing that would make a fine addition. In past issues, you have published a great deal about new engineering projects that have interested me tremendously—"Electricity Conquers the Arctic," "Electricity from Ocean Tides," "Radium from the Ocean Floor." The material you gave in the original articles was fine, but I, and I'll wager a lot of other readers, like to follow these things up, so why not publish a page or so each month reporting on the progress of these various undertakings as well as on the many new inventions you describe?—K.G., Wentworth Falls, Australia.

HI, FOLKS, I'M IN AGAIN





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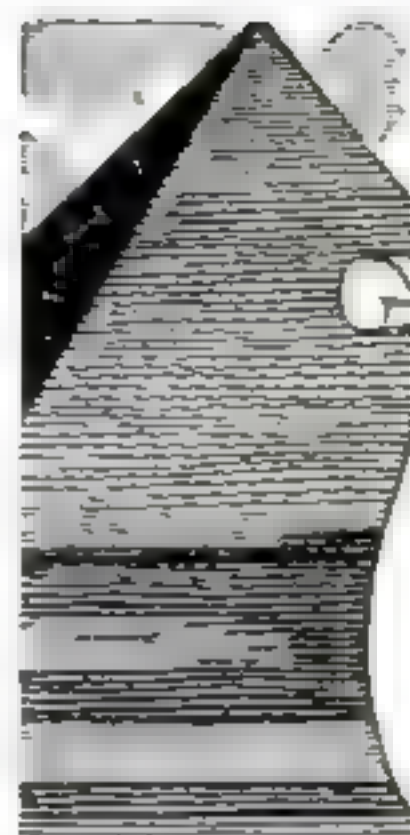
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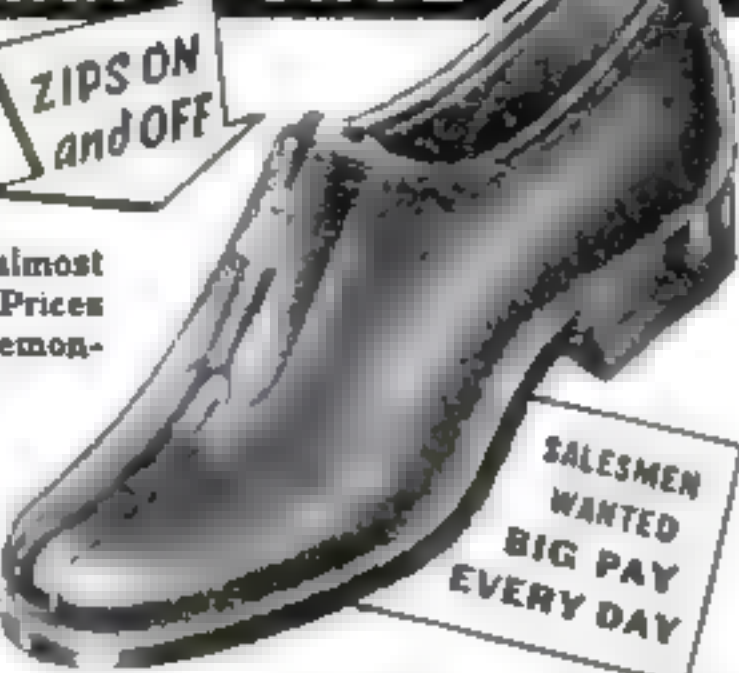
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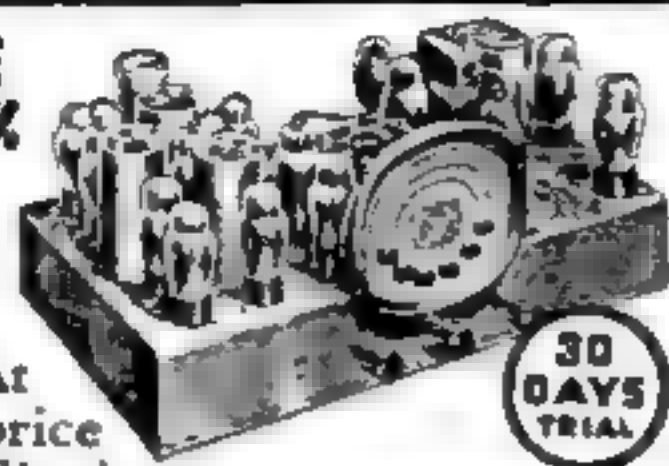
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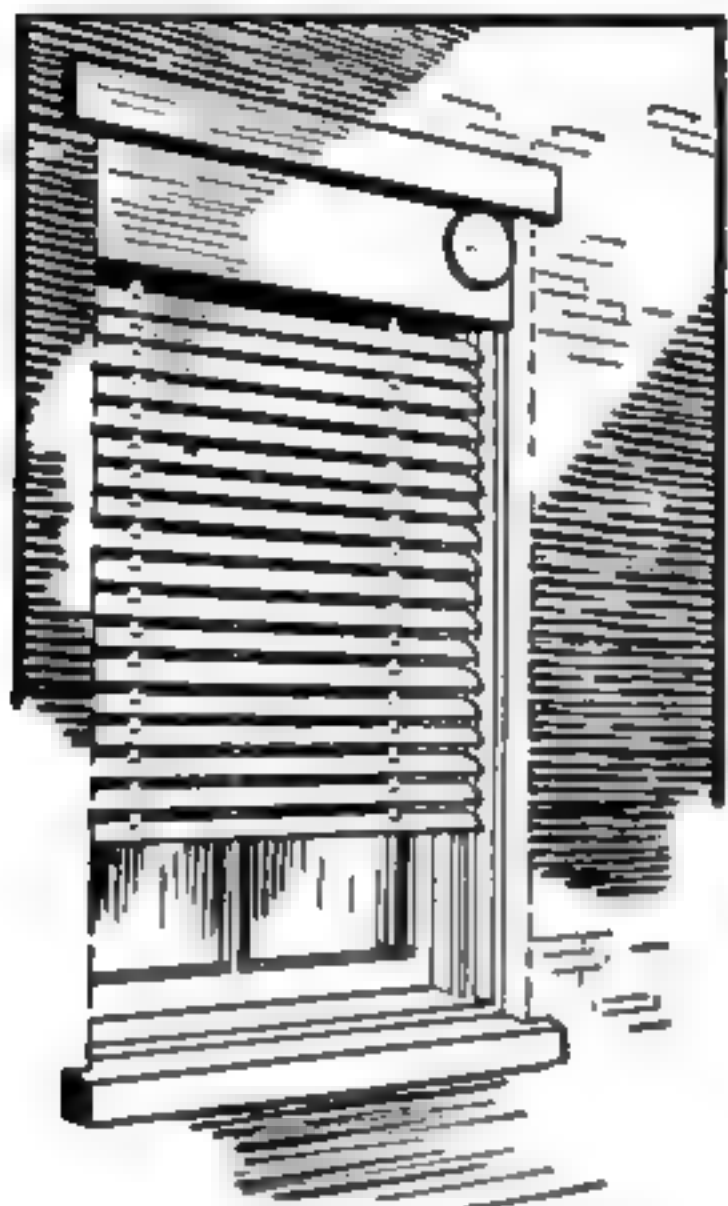
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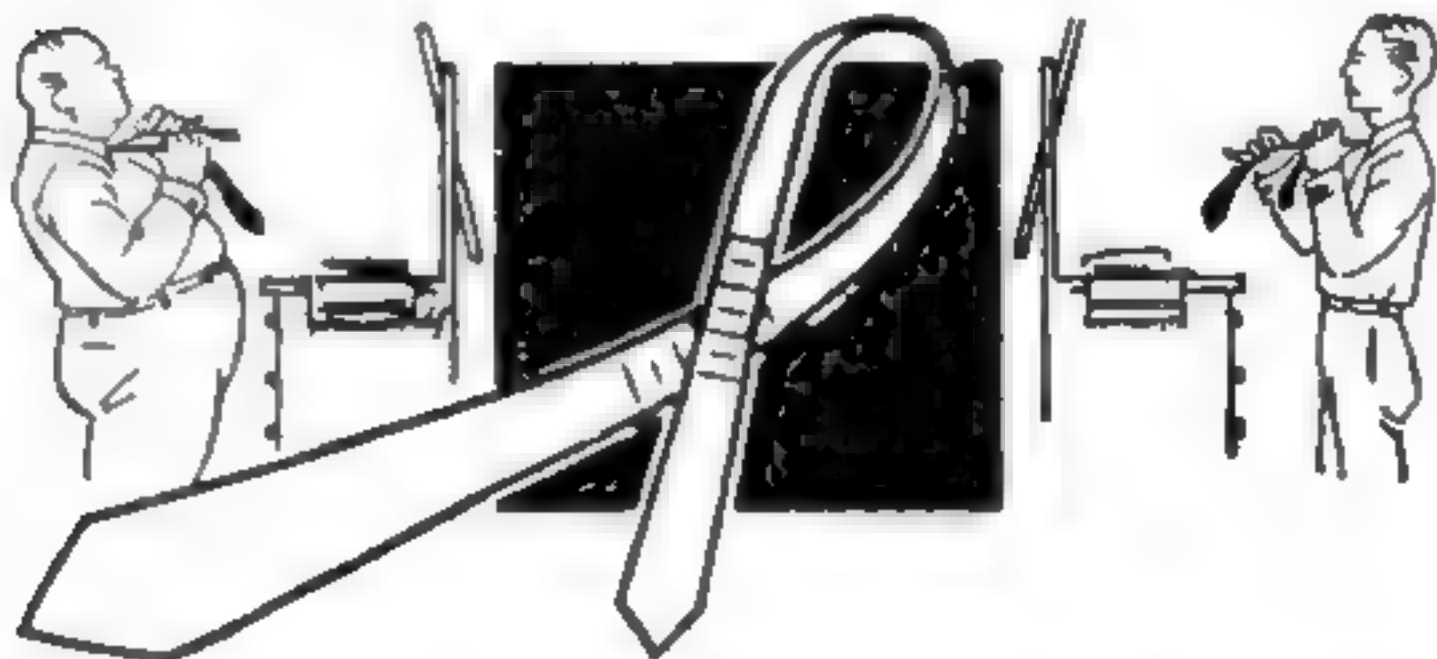
# With the Inventors

**A**N INGENIOUS window shutter devised by Edward Van Bosch and Reinhold H. Hoffman, of Chicago, Ill., raises or lowers itself automatically in response to outside weather conditions. Horizontal metal vanes, like those of Venetian blinds, ride up and



down along window-frame grooves which prevent them from flapping in the wind. An electric motor, housed in an inclosure at the top of the shutter, operates cables that lift or lower the vanes. Shutter movement can be controlled by a motor switch on the inside of the window, or it may be actuated automatically by a thermostatic device set in a hemispherical

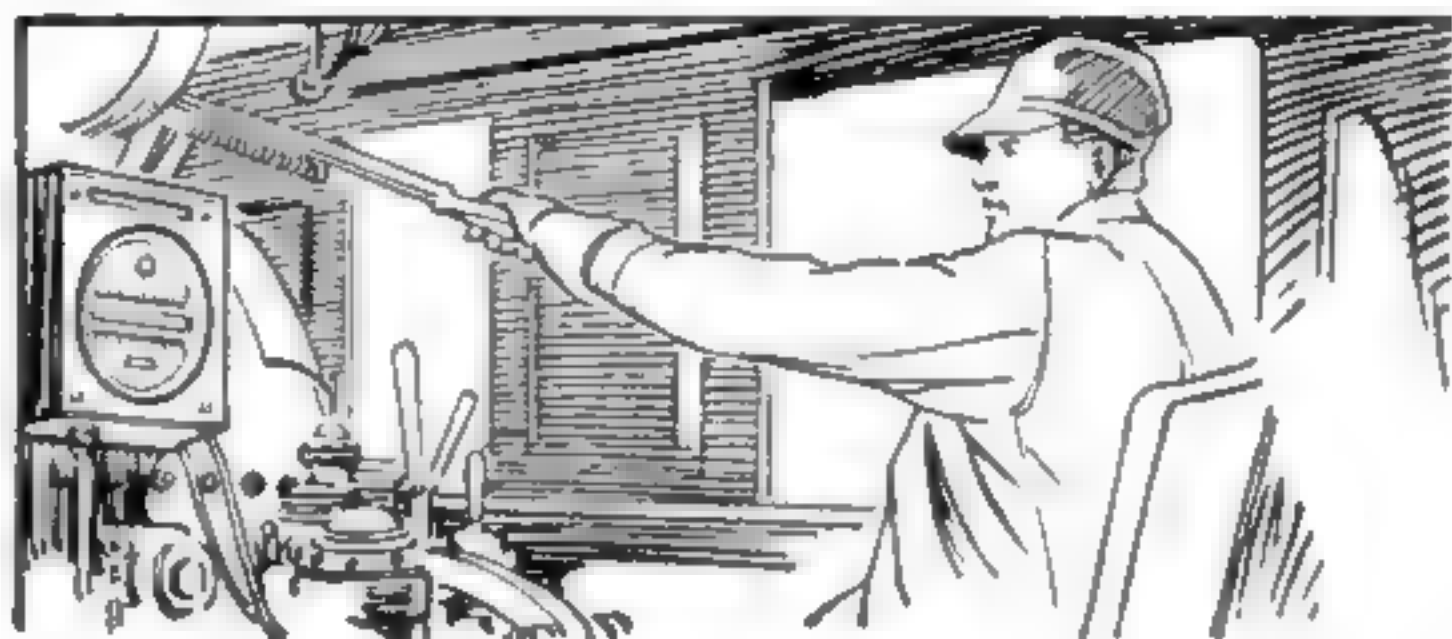
shell on the outside. This shell may also house a light-sensitive photo-electric cell, so that the shutter will raise or lower itself not only in response to changes in outside temperature, but also to changes in the strength and brilliance of sunlight . . . AN ADVISORY GROUP of twenty-four experts has just been named to confer with a Congressional committee on patents, to consider proposed reforms of the patent laws, which have changed but little from those enacted more than 100 years ago . . . MEN WHO STRUGGLE to make a smooth, even, four-in-hand knot in a necktie, only to find that one tie end is short while the other dangles below belt level, should welcome the simple solution to the problem



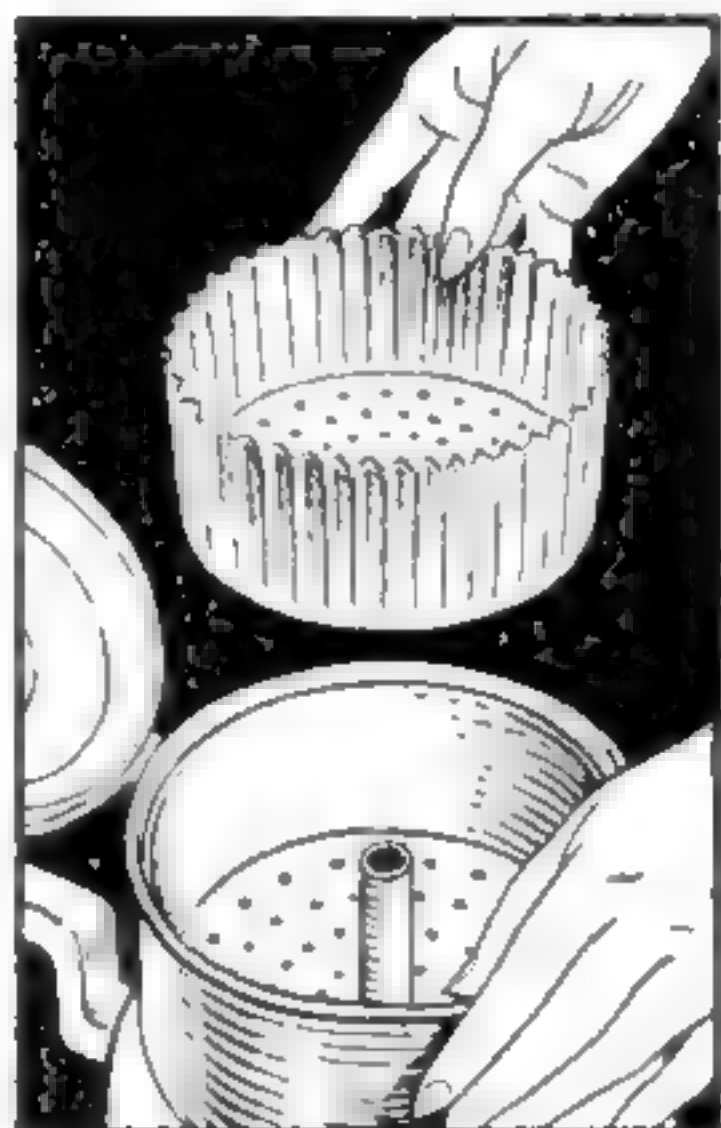
offered by Leon Garfinkle, of San Fernando, Calif. A tape sewed to the underside of the necktie bears guide lines, marked in relation to collar sizes, which are followed when forming the knot to make sure that the free ends will hang down to approximately the same

(Continued on page 24)

length . . . IF TWO OR MORE INVENTORS have applications pending on the same invention, the burden of proving that he invented the device or process first rests on the man who filed his application in the patent office last . . . REAR-END RAILROAD-TRAIN COLLISIONS are



made practically impossible by an ingenious signaling system invented by Donald V. Edwards, of Montclair, N. J. Installed in a locomotive cab, the apparatus tells the engineer the exact distance between his train and a train ahead traveling in the same direction on the track, as well as the precise speed of the leading train. A transmitter in the engine cab sends an electrical wave through one track rail. This travels along the rail, up one wheel of the train ahead, through the axle, and down the opposite wheel to the second rail, along which it returns to the transmitting train, where it is picked up by a receiving unit incorporating a cathode-ray tube. A fluorescent white spot projected onto a scale marked on the screen at the end of the tube indicates the distance away and the speed of the train ahead . . . MANY IMPORTANT INVENTIONS were made by men who earned their living in fields totally unrelated to the invention. The typewriter, for example, was invented by a farmer, and the stock ticker by a dentist. Samuel F. B. Morse, inventor of the telegraph, was a well-known portrait painter . . . A PAPER LINER PLACED inside of the coffee-grounds holder of a percolator makes it easy to dispose of the soggy grounds after the beverage has been made. The paper is lifted out bodily, taking all of the wet grounds with it, for easy disposal. Made like





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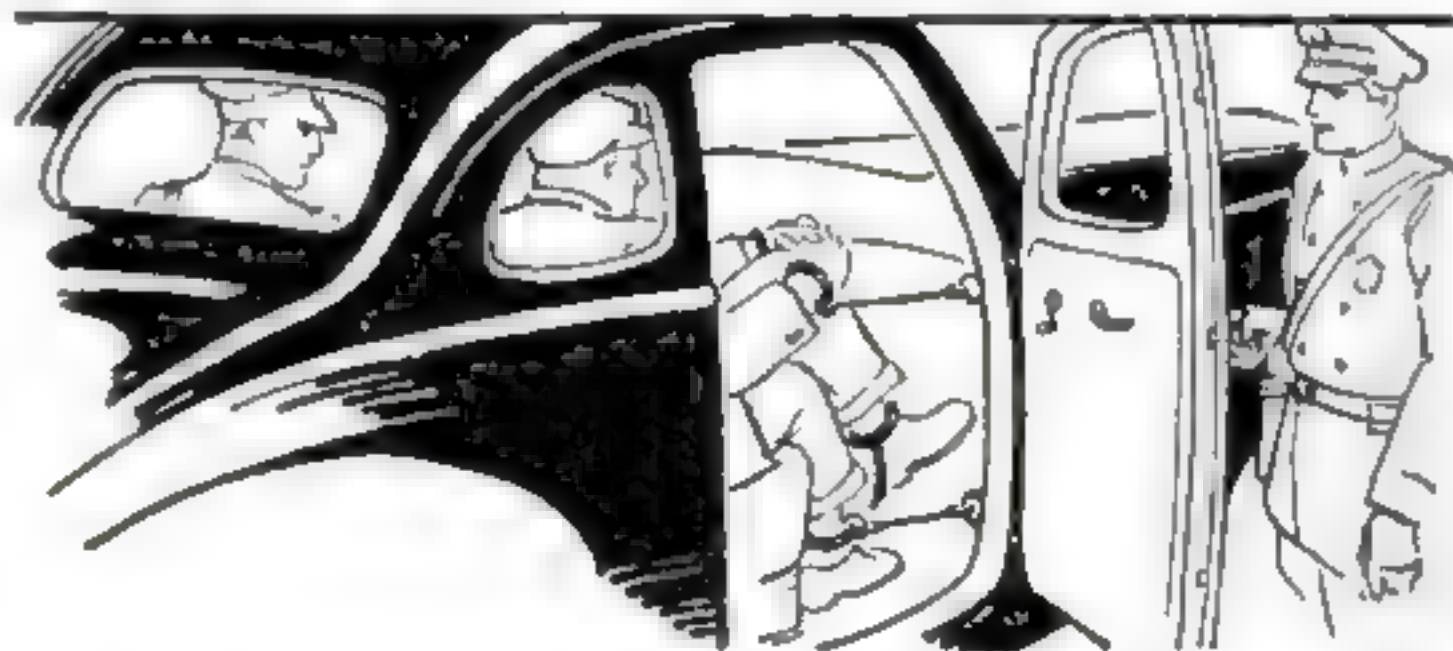
## With the Inventors

(Continued from page 22)

a paper drinking cup, the unit has bottom perforations to pass liquid coffee down to the pot below. This simple but helpful idea was worked out by Ralph T. Pitt, of Quincy, Mass. . . . EMPLOYEES OF THE United States Patent Office are the only persons barred from taking out United States patents . . . TEETH ARE BRUSHED, gums massaged, and particles of food dislodged from between the teeth, all at the same time, with a molded rubber toothbrush developed by



Paul M. Axline, of East Lansing, Mich. Shaped somewhat like glass telephone-pole insulators, the soft rubber brush head contains rows of tiny vacuum cups which create suction to draw bits of food from tooth crevices where decay often starts . . . FIVE SEPARATE ITEMS comprise a complete patent application: A petition, or formal request for a patent; the specifications of the invention; drawings; an oath declaring that the applicant believes himself the first and sole inventor of the device; and a filing fee of thirty dollars . . . POLICE CARS become traveling jails when fitted with handcuffs and leg irons, as suggested by Claude J. and Bessie V. Fitzgerald, of Wyandotte, Mich. Anchored firmly to a forward pillar of the automobile frame by means of metal links, the manacles move



sufficiently for the comfort of the prisoner sitting beside the driver, but not enough to allow him to open the car door or interfere with the operation of the car by grabbing the wheel or reaching dashboard controls . . . PATENT CLAIMS ARE usually long and involved, but the first claim of one patent contains only three words: "An elliptical turret." . . . BY DROPPING A COIN in a slot machine,

(Continued on page 26)



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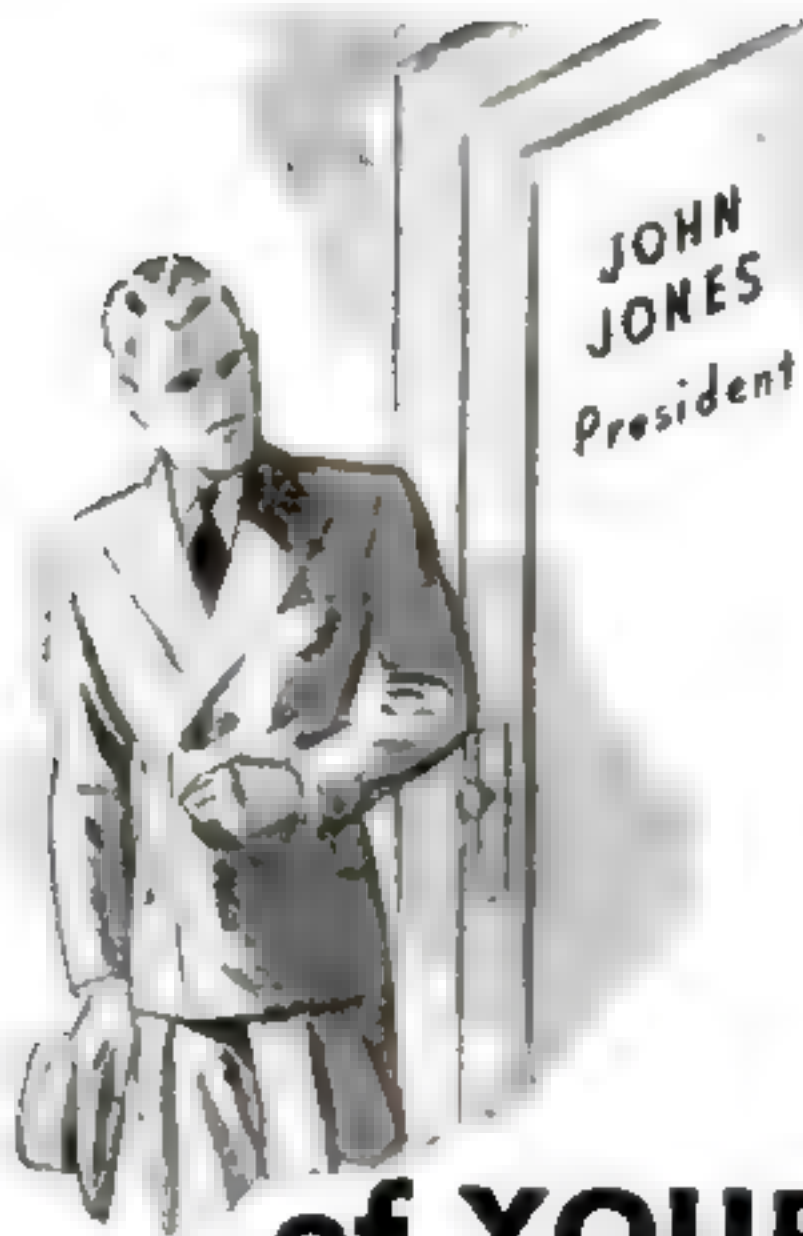
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## With the Inventors

(Continued from page 24)



you can now buy practically anything from chewing gum, candy, and cigarettes to toilet articles, five-minute movies, and insurance policies. But the list is still growing. George A. Snyder, of West Hollywood, Calif., recently announced a slot machine that takes your coin and tells you your blood pressure. Electrically controlled, the unit has a horizontal rest in which a person places his arm.

Pressure is applied to the arm to stem temporarily the flow of blood and determine its force, which is indicated on a dial . . . PATENTS may be mortgaged like homes and similar personal belongings . . . No FIXED FRAMEWORK of wood or metal is required to support an unusual pneumatic chair invented by Archibald H. Finlay, of Hollywood, Northern Ireland. Made of tiny rubber cells within separate envelope sections that comprise the back, sides, and seat, the chair is inflated through a built-in valve by means of a tire pump or other source of air pressure. When not in



use, the chair may be deflated, folded, and stored away in a small space . . . A LAWN-SPRINKLER just invented by Anton W. Pfeffer, of Spokane, Wash., is fitted with a float valve, similar to the type used in bathroom flush tanks, that automatically shuts off the water after a period of time, in case the householder forgets!





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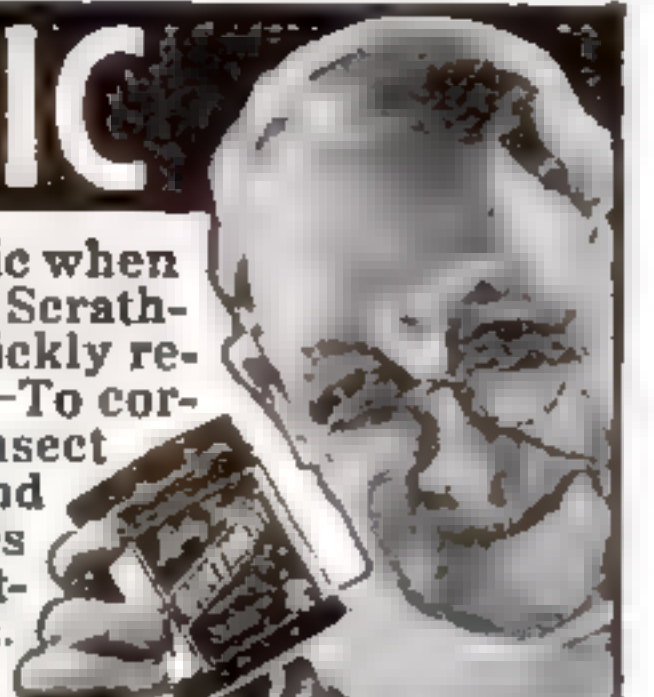
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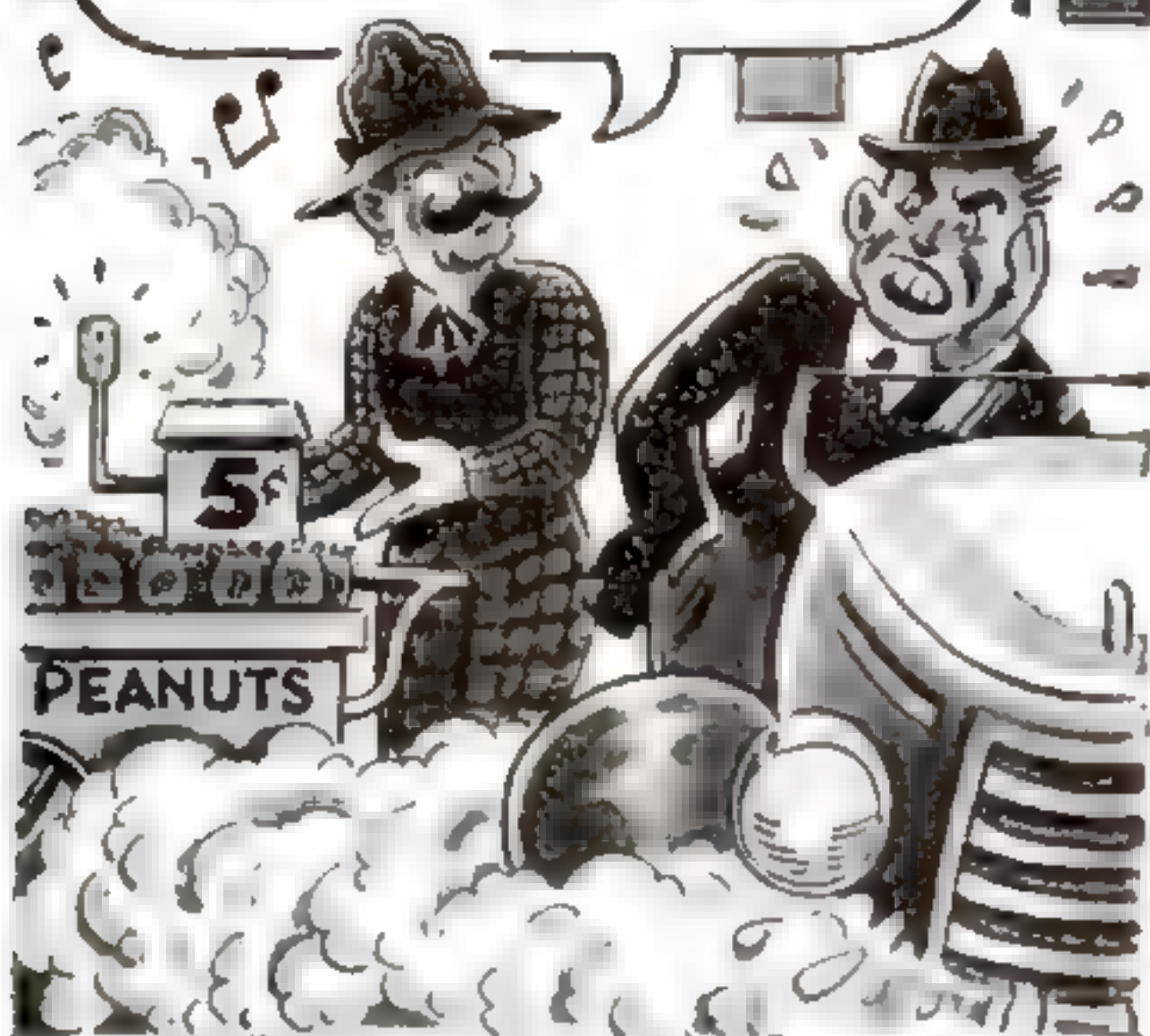
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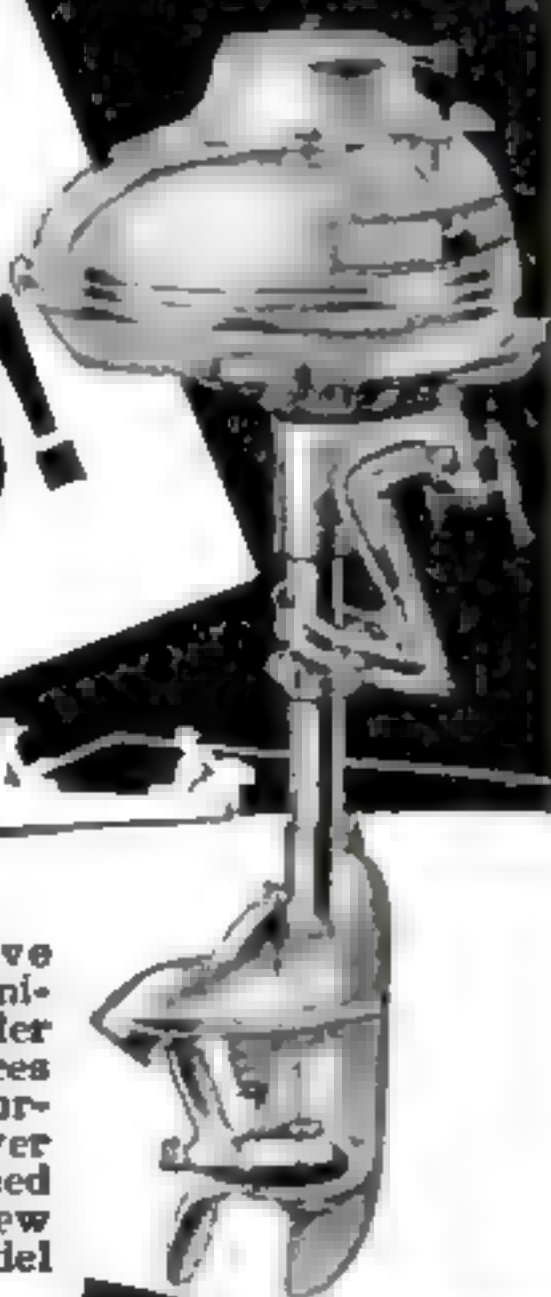
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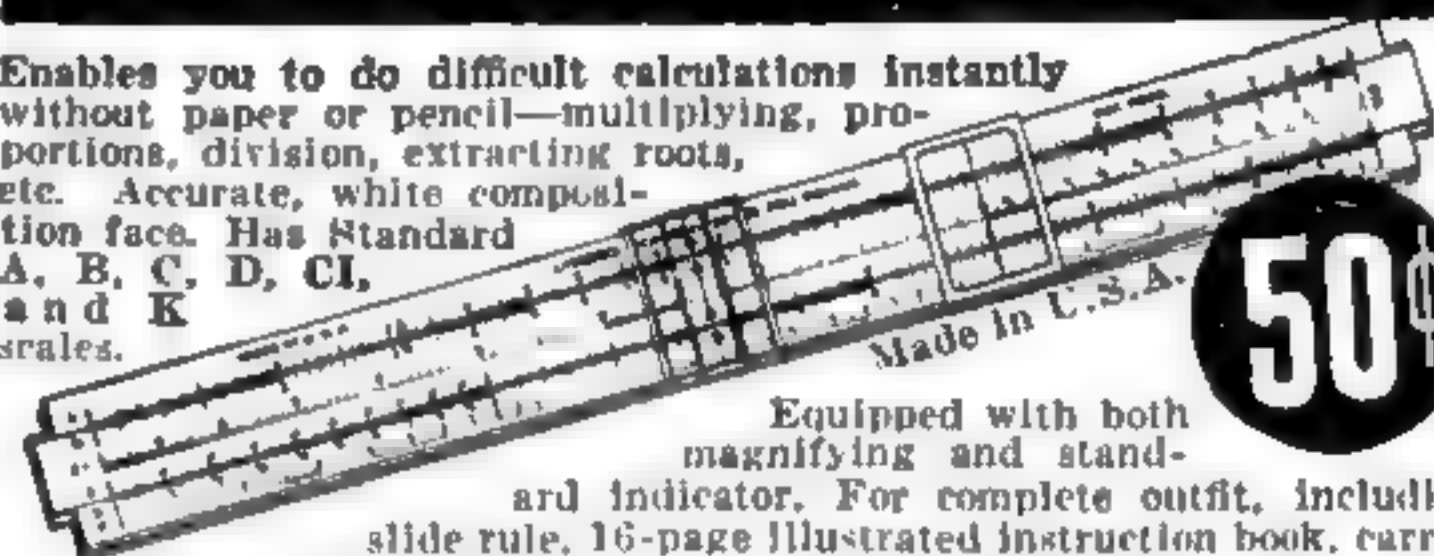
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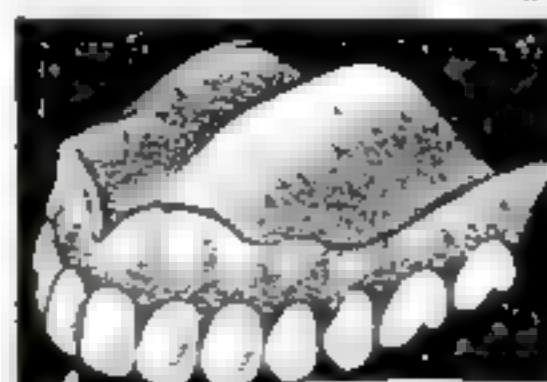
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A SLOT in the easily attached clip for hammers shown at the left holds a nail so that it may be started easily in an awkward spot. When tapped lightly into place, the nail is released by a twist of the hammer, and then driven home in the usual manner.



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AS EASILY adjusted as a curtain rod, a newly developed all-metal window screen can be extended vertically or horizontally. Available in nine different sizes, the screens require no fitting or trimming to make them fit snugly, even though window openings are warped, or otherwise out of square. The metal frames of the screen extend or contract by sliding. They may be mounted from inside the window, and require no painting or other maintenance.



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Killed electrically, flies drop on a removable tray



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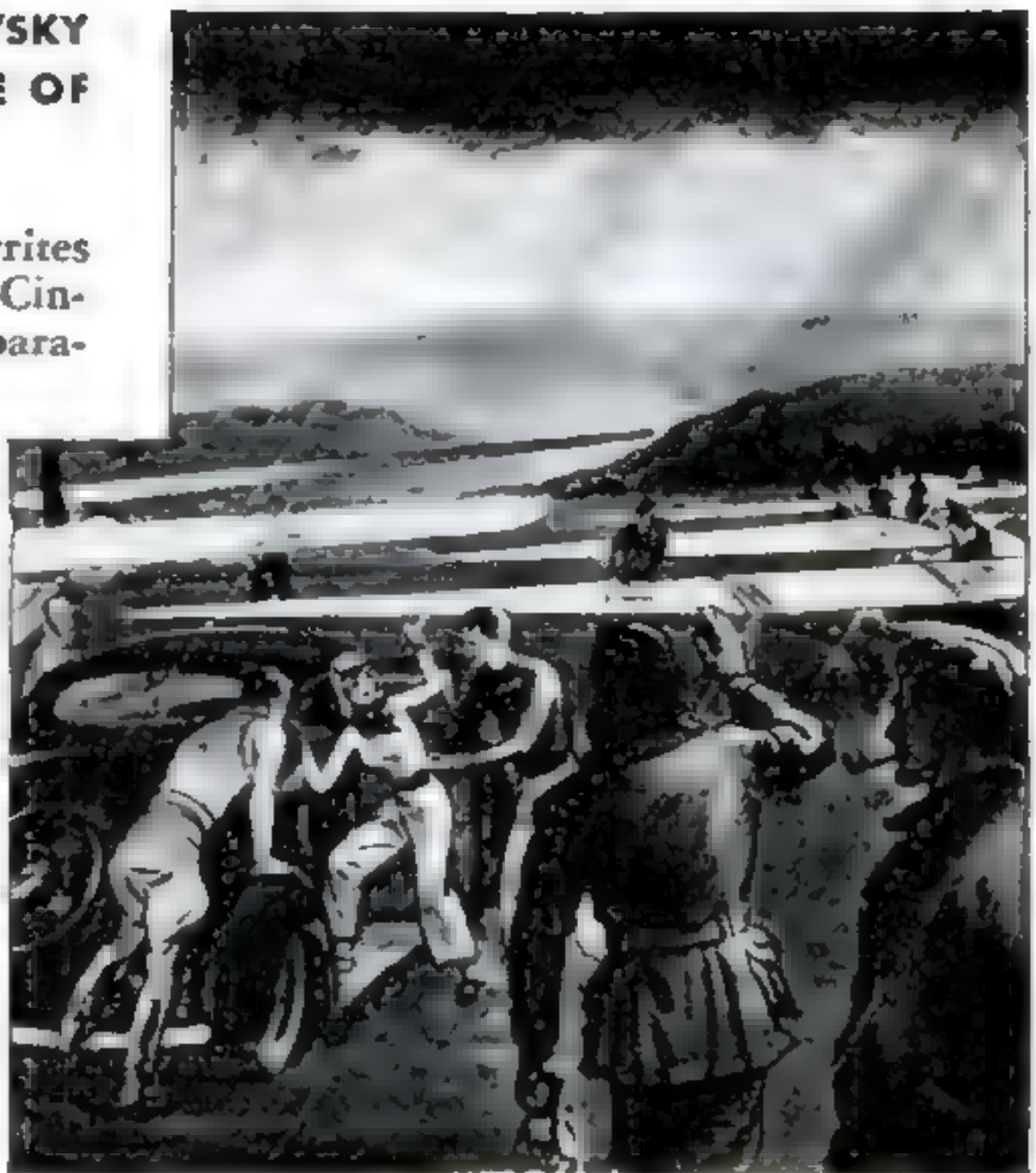
"I left Elmira in the rain after the National Glider Meet with 380 miles to drive before morning to get back to work in Mansfield. My nerves were already shaky and I had to drive faster than was safe or I'd never make it.



washed away the whole center span! 'Eveready' *fresh* DATED batteries had saved me from many a broken leg in night jumps, but this time they went the whole way. From now on I'm sticking to batteries that stick to me. (Signed) *Gretchen Reighard*"

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"I swooshed down a hill, skidded the turn at the foot of it, and dimly made out a sign 'Bridge Ahead.' Then I saw the end of the bridge. In the diffused light of my head lamps the road looked all right.

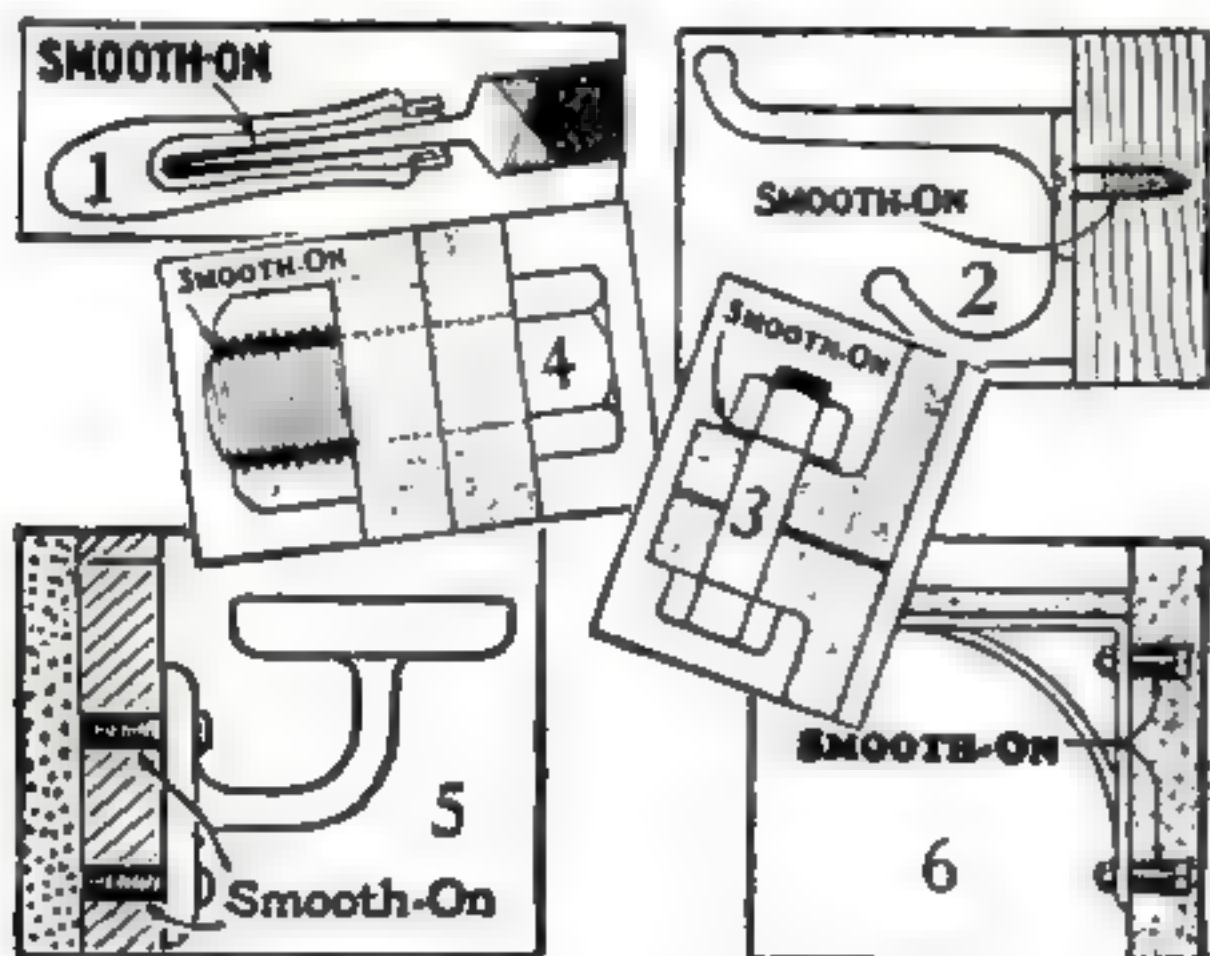
"But just to make sure, I rolled down the window and poked my flashlight out... and my heart nearly choked me! Ten yards of wet planks between me and Kingdom Come! My flashlight showed me the jagged end of that broken bridge, and none too soon. The raging creek had





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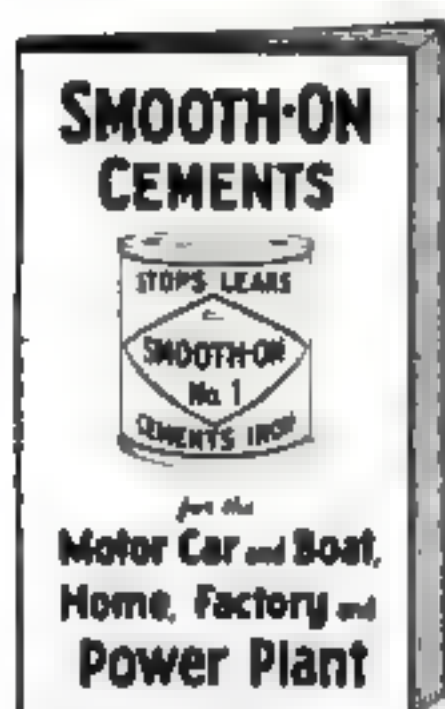


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**Q.**—BEFORE putting up awnings for the summer, I plan to renovate them. Although the awning fabric is still strong, the colors have faded badly. How can I repaint them without having the paint sink through?—F.L.W., Powell, Pa.

**A.**—FOR painting awnings, a paint containing as little oil as possible is generally used. You can mix your own from paste white lead tinted with dry, powdered colors, rather than colors ground in oil. Thin this with turpentine and add about a tablespoonful of japan dryer to two quarts of paint. Apply with crisscross strokes, heavily enough to cover the awning with one coat of paint.



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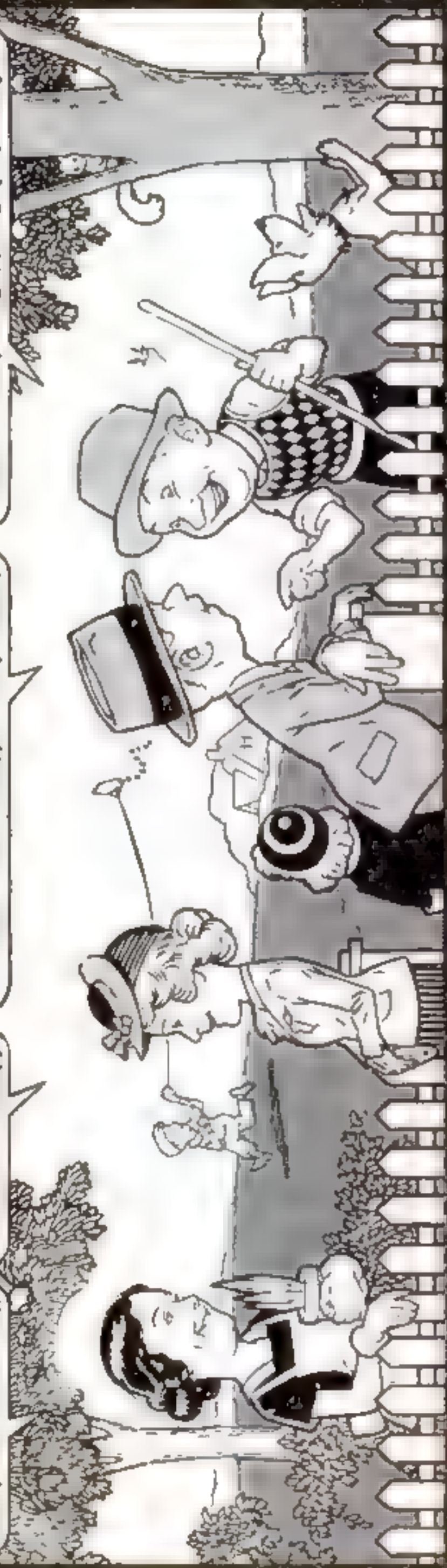
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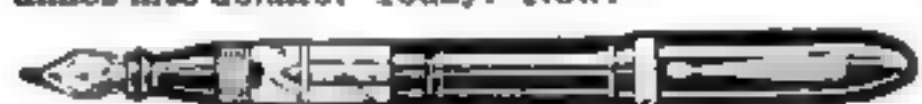
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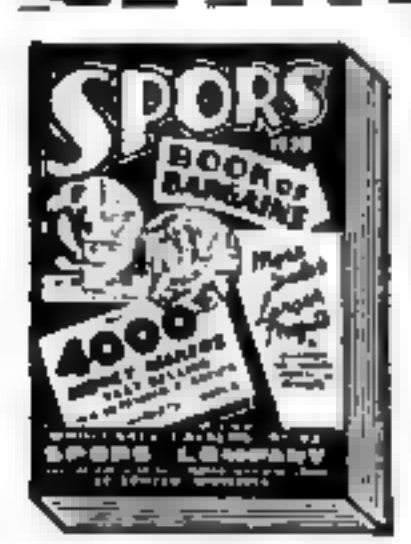
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**AIR** Compressors, new,  $1\frac{1}{2}$ x $1\frac{1}{4}$ , \$6.00, 2x2, \$7.00,  $2\frac{1}{2}$ x2, \$8.00. Guaranteed. Send check or money order. National, 560 Washington, Chicago, Ill.

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**MOTOR** Rewinding lessons, illustrated. Send stamp for particulars. Motor Data, Box 7631, Kansas City, Mo.

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**INVENTORS:** Send for free copy my 72-page book on patents. Reasonable terms. Prompt action. Confidential, personal service. L. F. Randolph, Dept. 768, Washington, D. C.

**INVENTORS:** State lowest price for your invention, and send details at once to Adam Fisher Company, 183 Enright, St. Louis, Mo.

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**BEFORE** you take any steps write for bulletins on our complete services, to save you money. R. & S. Engineering, Dept. SP1, 17 East 42nd Street, New York City.

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# Why Trained Accountants Command

[—and how ambitious men are qualifying  
by the La Salle Problem Method ]

## High Salaries

**G**ET this straight.

By "accountancy" we do not mean "bookkeeping." For accountancy begins where bookkeeping leaves off.

The skilled accountant takes the figures handed him by the bookkeeper, and *analyzes* and *interprets* them.

He knows how much the costs in the various departments should amount to, how they may be lowered.

He knows what profits should be expected from a given enterprise, how they may be increased.

He knows, in a given business, what per cent of one's working capital can safely be tied up in merchandise on hand, what per cent is safe and adequate for sales promotion. And these, by the way, are but two of *scores* of percentage-figures where-with he points the way to successful operation.

He knows the intricacies of government taxation.

He knows how to *survey* the transactions of a business over a given period; how to show in cold, hard figures the progress it has made and where it is going. He knows how to *use* these findings as a basis for constructive policies.

In short, the trained accountant is the *controlling engineer* of business—one man business cannot do without.

Small wonder that he commands a salary two to ten times as great as that of the bookkeeper. Indeed, as an independent operator (head of his own accounting firm) he may earn as much as the president of the big and influential bank in his community, or the operating manager of a great railroad.

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Small wonder that accountancy offers the trained man such fine opportunities—opportunities well illustrated by the success of thousands of

LaSalle accountancy students.\* For example—one man was a plumber, 32 years old, with only an eleventh grade education. He became auditor for a large bank with an income 325 per cent larger.

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### And What It Means to You

Why let the other fellow walk away with the better job, when right in your own home you may equip yourself for a splendid future in this profitable profession?

Are you really *determined* to get ahead? If so, you can start at once to acquire—by the LaSalle Problem Method—a thorough understanding of Higher Accountancy, master its fundamental principles, become expert in the practical application of those principles—this without losing an hour from work or a dollar of pay.

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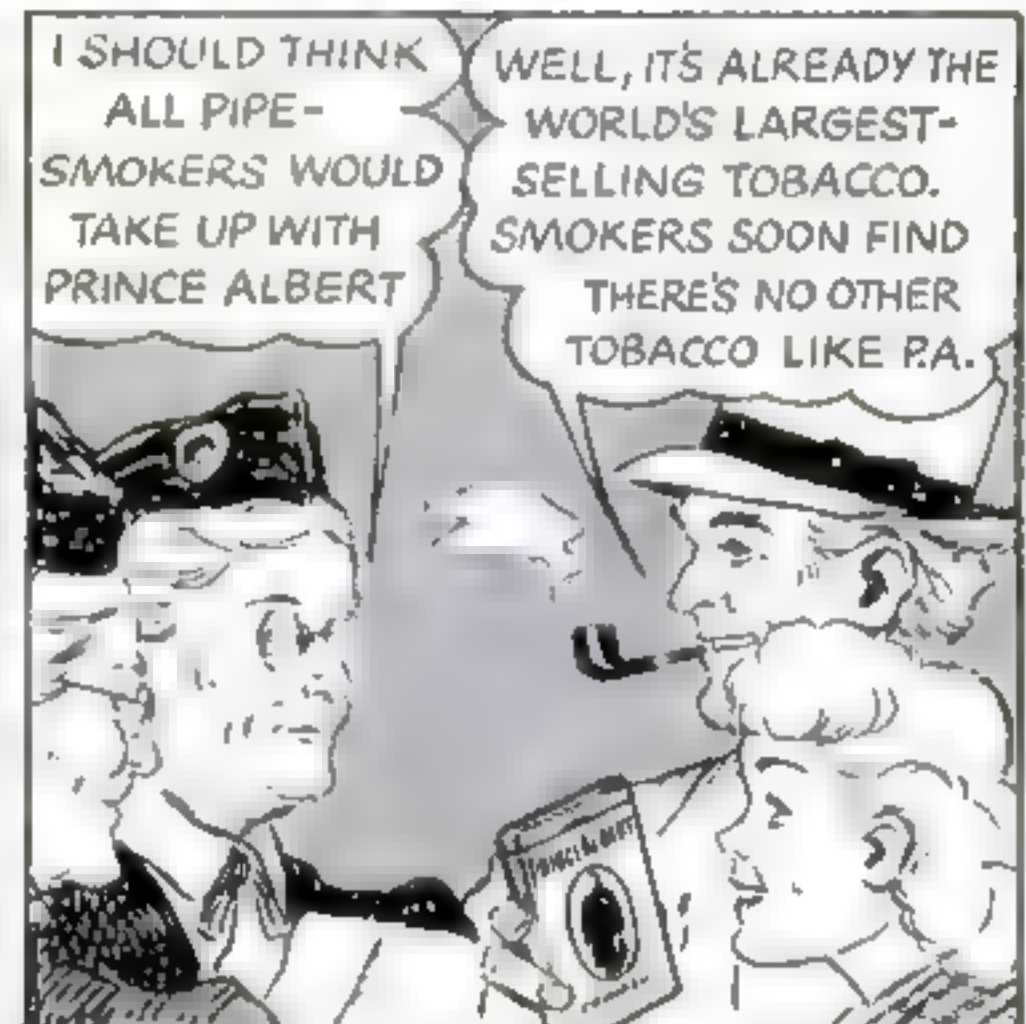
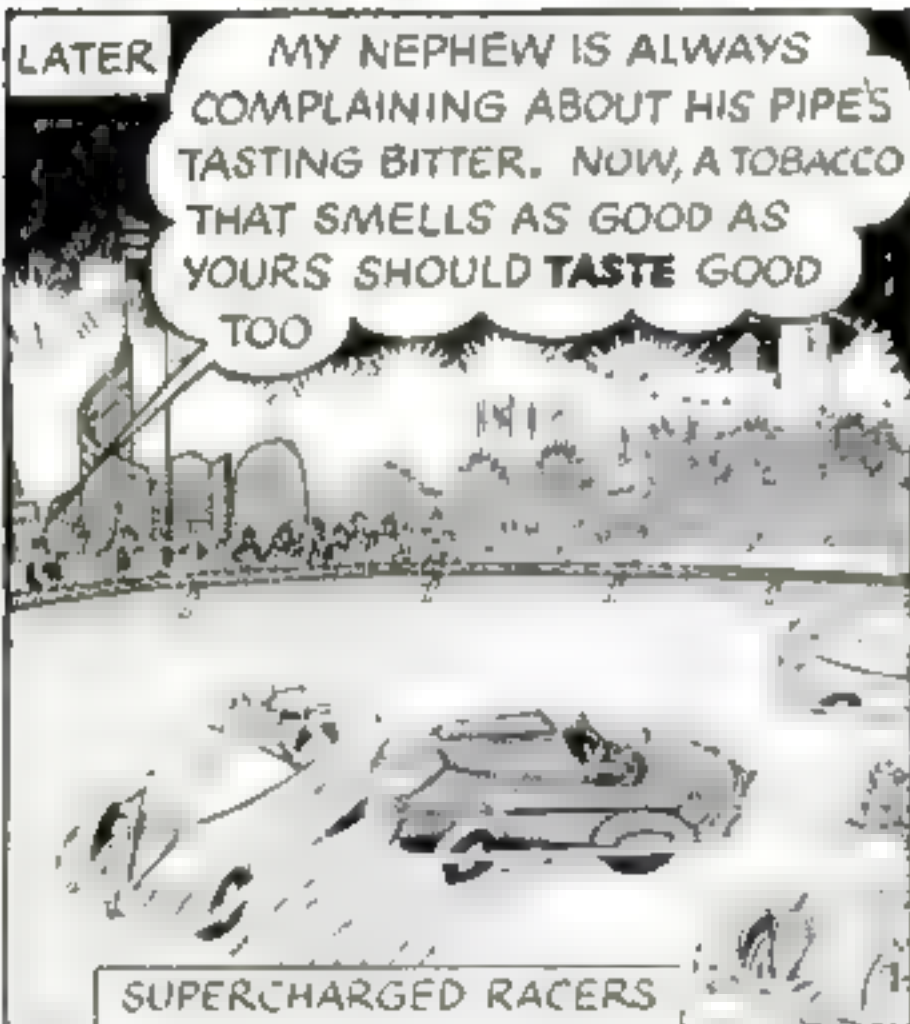
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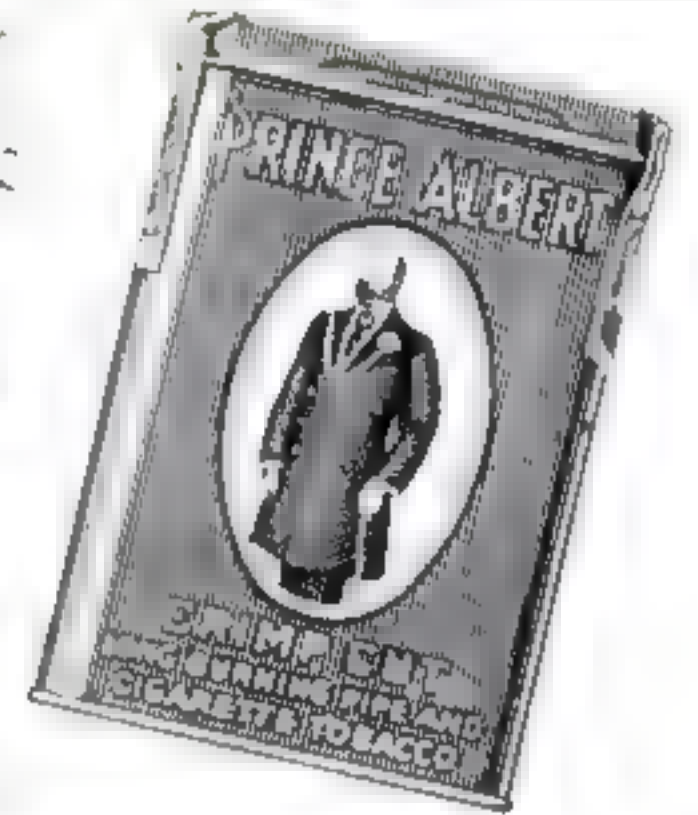


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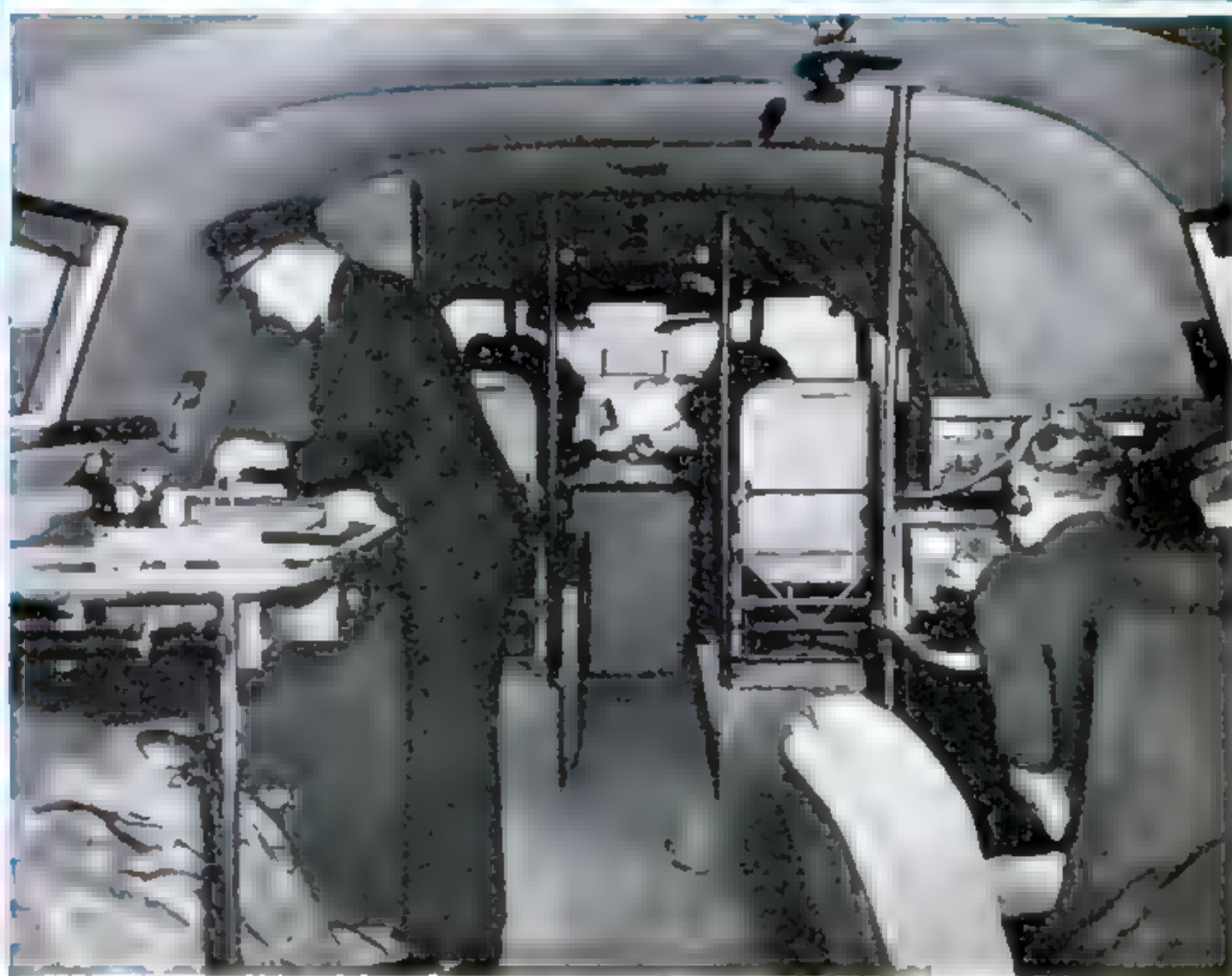


Monthly  
RAYMOND J. BROWN, Editor



## NEW SAFETY DEVICES GUARD TRANSATLANTIC PLANES

**O**N WINGS sixty-two feet longer than the ship in which Columbus sailed to the New World, Pan American Airways' 82,500-pound "super-clipper" flying boat will soon lift from Long Island Sound on its initial passenger run to Europe. In twenty-four hours, it will cross the sea on which Columbus's *Santa Maria* tossed for ninety-two days. Half a hundred pas-



Control room of the super-clipper, with members of the crew at their posts

sengers and a cargo of 5,000 pounds will ride in the great silver-colored hull of this aerial luxury liner. No other craft ever rode the air with as many aids to comfort and safety as the new machine will carry. Instruments

By PAUL A. CLARKSON





Radio officer, left, and flight engineer at their stations. Dials show details of plane operation

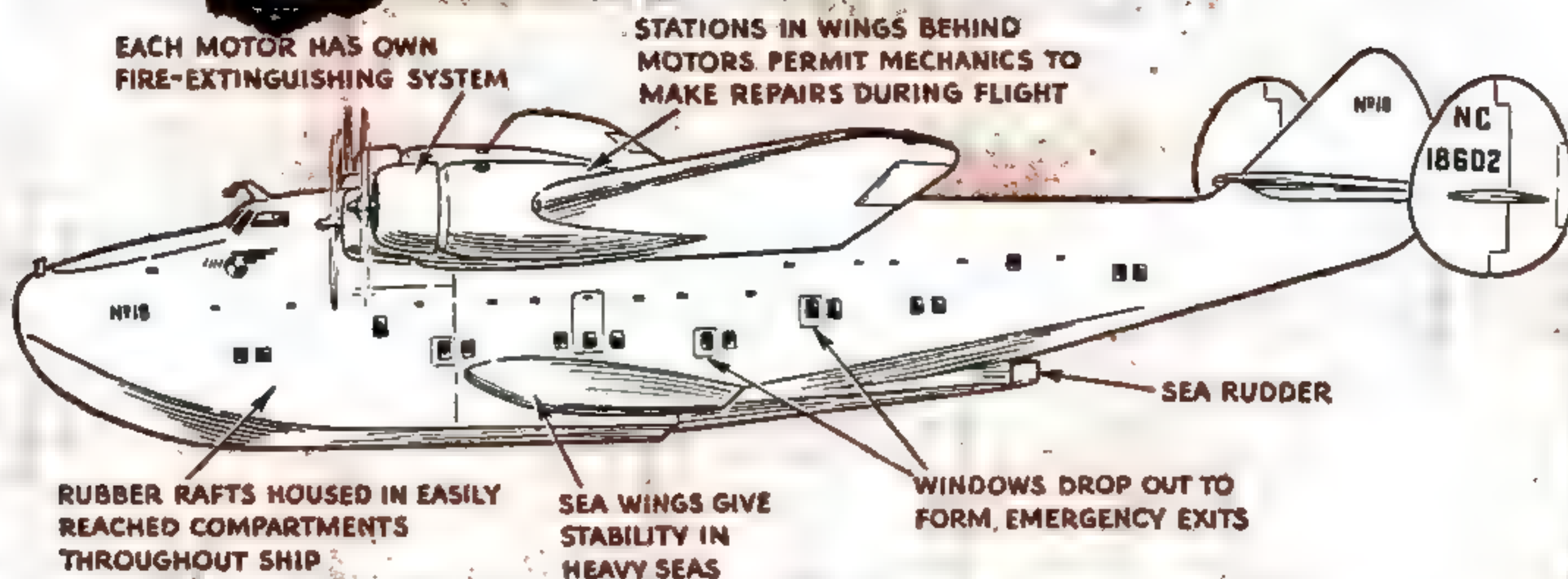
so clever that they almost think will assist the pilots and protect the passengers. Throughout the flight, a delicate analyzing mechanism will suck air from all parts of the ship, flashing a red warning light if carbon monoxide gas or other impurities are present. Soundproofing will reduce the noise within the cabin to less than that of a railway coach. The whole interior will be air-conditioned and kept at a constant temperature. Five seven-room houses could be warmed by the plane's heating system.

Built at the Boeing plant in Seattle, Wash., the new transatlantic sky boat—the first of a fleet of six—is the biggest airplane in the world. Its hull is 105 feet

**IN AN EMERGENCY,** the plane's heavy sea anchor, seen above, can be released through an opening in the side or from the bow hatch. At right, levers beside the pilots' seat operate the fuel dump valves



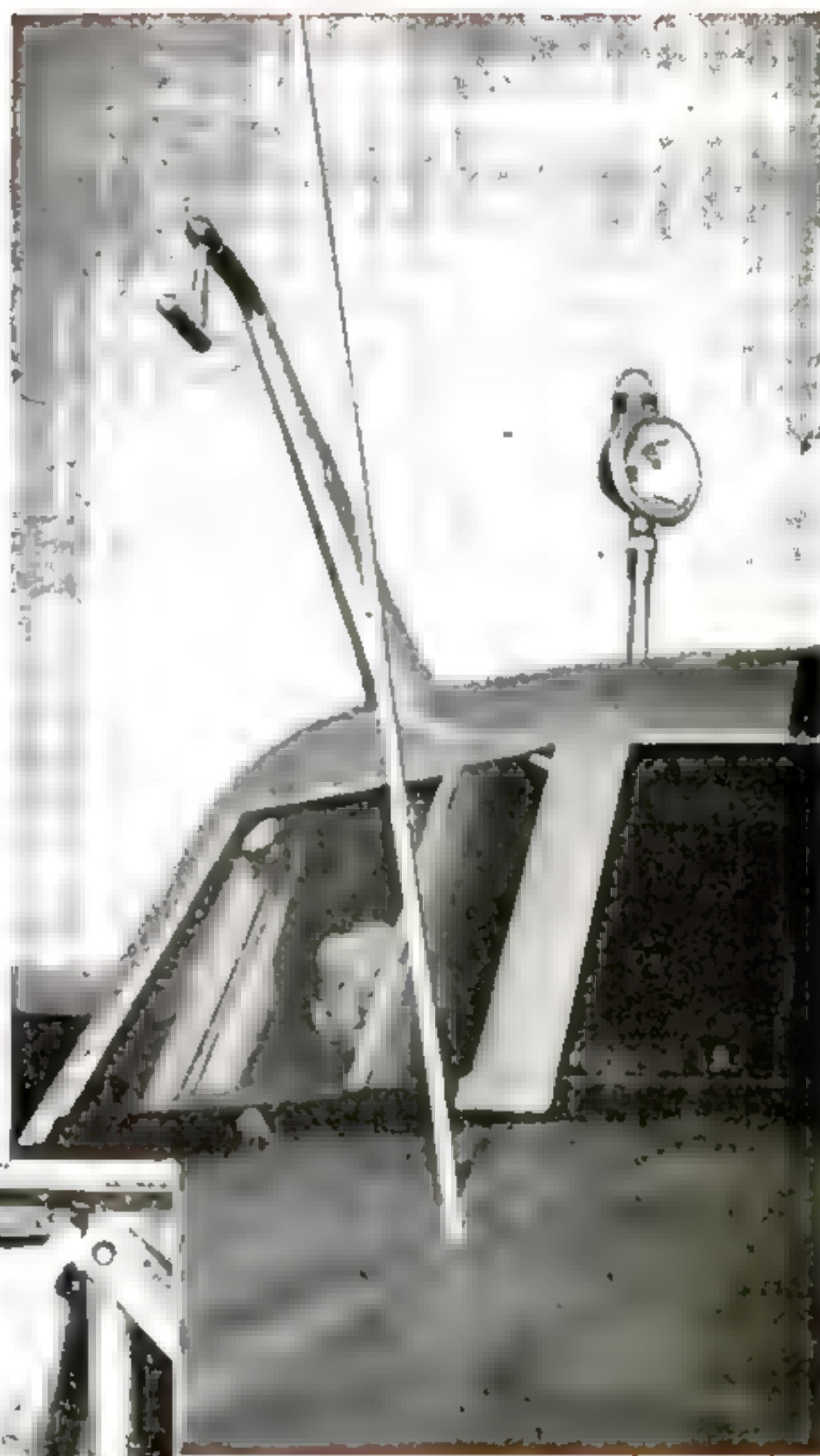




in length and its wings stretch 152 feet from tip to tip. With all four of its 1,500-horsepower Wright Cyclone engines thundering at full throttle, the all-metal craft can climb to 21,000 feet with a useful load greater than the weight of the ship itself.

Spinning fourteen-foot, three-bladed steel propellers, the quartet of engines can drag the big boat through the air at a top speed of more than 200 miles an hour. At cruising speed, 150 miles an hour, one filling of the tanks will carry the transatlantic sky liner 4,275 miles. An average automobile could travel more than twice around the world on the 4,300 gallons of high-test fuel the tanks will hold.

Throughout the ocean voyage, instruments will show the temperature of each of the fifty-six cylinder heads in the air-cooled power plants. Every motor has its own fire extinguisher built into the wings of the plane, and catwalks through the interior of the great supporting surfaces enable mechanics to reach the engines and make adjust-



For night landings and taxiing, a powerful searchlight can be swung up out of a recess in the cabin roof by means of a lever, as at the left







Very pistol for emergency night signaling. The cartridge case beneath it contains red, green, and white flares

ments and repairs in flight. With two of its four motors out of commission, the flying boat can still remain in the air.

Beneath every passenger seat, a special compartment will hold a life jacket, while

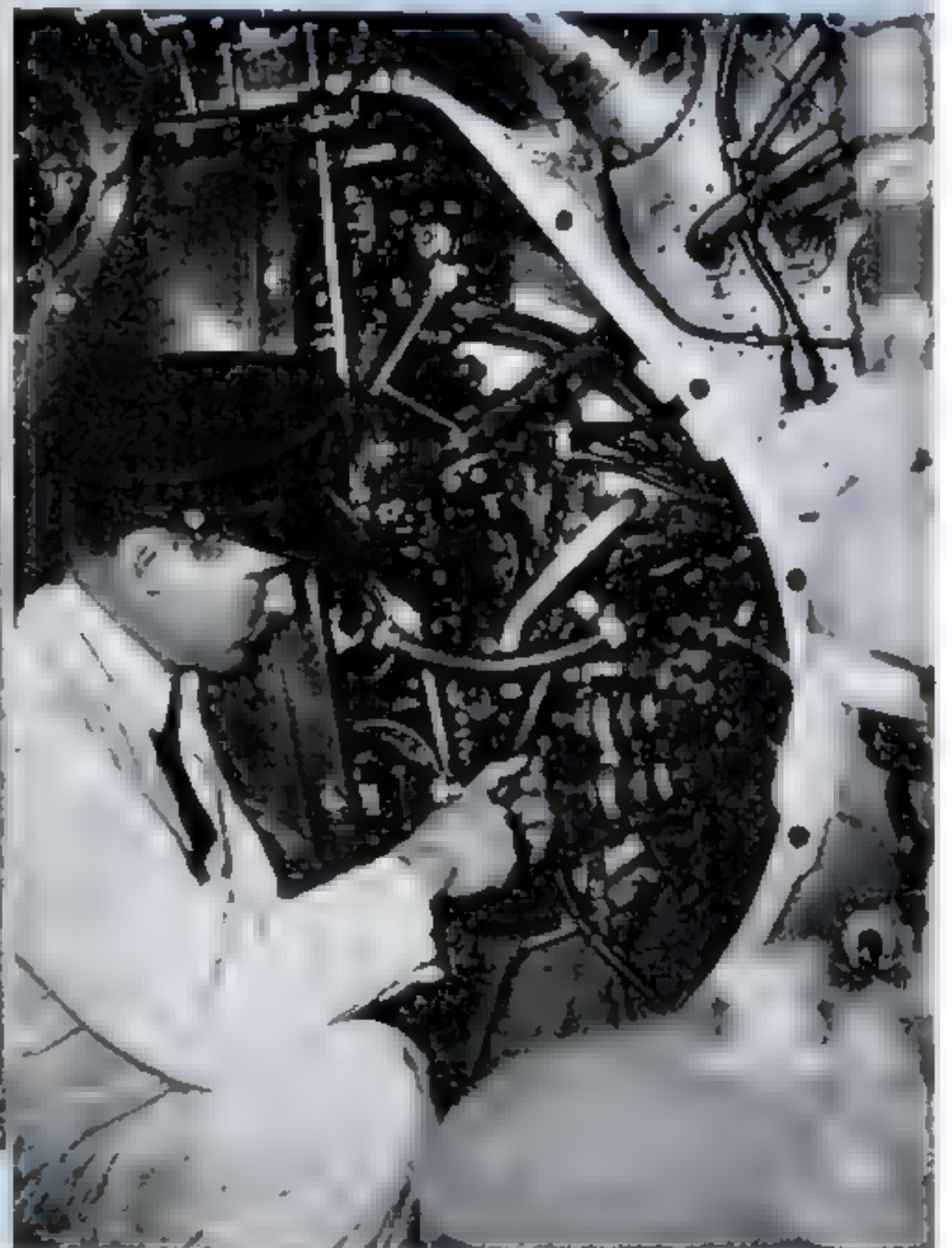
ten-man life rafts, which can be quickly inflated by built-in gas cartridges, will be carried at strategic points within the hull. In a few seconds, thirty doors and windows can be converted into emergency exits. Jerking out a small lever near-by will cause the window or door, frame and all, to drop from its place.

To provide every possible convenience for the man who handles the controls, various innovations have been incorporated in the design of the new ship. A small button on the control wheel permits the pilot to illuminate the instrument panel without taking his hands from the controls. An automobile-type sun visor can be swung down when the machine is flying toward the rising or setting sun. By pulling down a lever overhead, the pilot can lift a powerful searchlight into position to aid in taxiing about after a night landing.

Two other innovations help control the boat on the water. To increase the ease of maneuvering about before a take-off and after a landing, an underwater rudder operates in conjunction with the air rudders. "Sea wings," technically known as hydro-stabilizers, give the machine greater side-to-side stability, especially in heavy seas. These



Catwalks through the huge wings, like the one seen through a control-room door at the left, make it possible to repair or adjust any of the motors in flight





Under each seat is stowed a life jacket like this, ready to be put on at a moment's notice



Near each window and door is a handy lever. If it is pulled, the whole window or door frame falls out to make an emergency exit. Note frames in photo below



sturdy, winglike floats jut out from either side of the hull.

Inside the double-decked metal hull, life during a transatlantic flight will be like life in an up-to-date hotel. A galley, complete with ice boxes and steam tables, will permit stewards to prepare food for ninety people. To conserve weight, special lightweight silverware will be used at mealtime. During the voyage, passengers will read, smoke, walk about from room to room. Different parts of the plane will be connected by telephone. There will be lounges, dressing rooms, smoking rooms, private compartments—even a honeymoon suite—on board the aerial leviathan.

Sometime this month, with spray glistening on its metal hull, the super-clipper will lift from the water off North Beach Airport, New York City, and head out over the ocean, taking the southern route to Europe. The coastline will drop behind the triple stabilizers at the tail; 2,422 miles of tossing water will slip beneath the wide-spread wings. Then, on a long slant, the ship will slide down, skim the waves, and wallow to a stop at the Azores. Charging away again in a cloud of spray, it will take to the air, winging on to Lisbon, Portugal, before the final,



quick hop to its destination, Marseilles, France, or Southampton, England. Later in the summer, the great-circle route to Ireland and England, the path followed by Lindbergh, will be used by the super-clipper. The tentative fare for the transatlantic journey is \$450. Mail and express will go for twenty-five cents a half ounce.

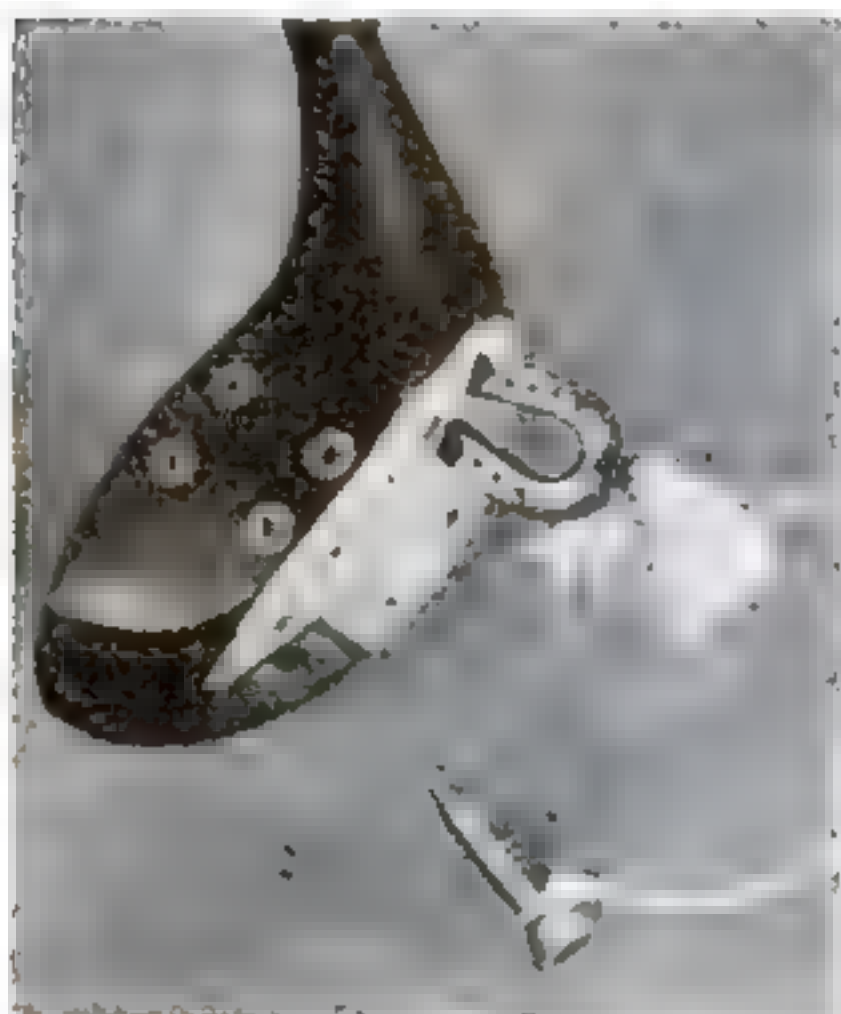
Since 1937, when survey flights across the Atlantic were begun by Pan American pilots in smaller flying boats, careful preparations have been made for the inauguration of regular service on the ocean airway. America, England, Germany, and France are racing for priority honors in starting the service. Refinements in detail and improvements for safety have been stimulated by this race for a rich trade route of the air. Culminating this advance comes the new super-clipper, soon to make its initial passenger flight.





## Parachutists Make Test Hops

HARNESSED to a rope running through a pulley attached to the ceiling, students at a German parachute-jumping school leap from an elevated scaffolding to practice the correct way to start a parachute leap through the open doorway of a plane. A fledgling pilot is shown above, about to hop off from the platform.



The tiny magnet will lift a tee right out of the ground

## Tee Picker-Upper for Tired Golfers

WOODEN tees are retrieved magnetically for weary golfers by a novel device now available. A tiny horseshoe magnet is tied to the tee with string. After driving off, the golfer touches the club head containing steel or iron against the magnet, which clings to the club, so that it can be picked up without stooping.

## Jiggles Cramps out of Jitterbugs' Feet

TO TREAT foot muscles that have become bunched and knotted from the strain of the jitterbug jiggling of modern dancing, a New York City foot specialist devised the exerciser pictured below. Patients stand shoeless on the hinged pedals of the apparatus while holding on to an upright handle. As they shift their weight, the pedals rock back and forth, flexing and stretching their leg muscles.



Muscles cramped by dancing are relaxed on this foot exerciser



# Weatherproof Paintings



J. Scott Williams, creator of outdoor murals of painted enamel, at work in his studio. At left, he is making a full-size outline on a paper pattern, which will be cut and transferred to enameled metal



**M**ARKING the introduction of a new form of art, an outdoor mural painting almost as big as a tennis court greets visitors to the Hall of Shelter at the New York World's Fair. With its hues of blue, yellow, and orange imperishably fixed in porcelain enamel, it represents the first large-scale use of a medium that can withstand the utmost rigors of exposure to the elements. Buildings may now be decorated with beautiful paintings, it suggests, both inside and out!

While "touching up" the murals of the old masters would virtually require a complete restoration, the new ones painted on porcelain may be kept bright simply by scrubbing them with soap and water. Their indestructibility may be gauged from the fact that it was the testing machine that broke, and not the enamel-coated metal, when a

**MURALS BAKED ON SHEET METAL  
USED FOR OUTDOOR DISPLAYS**





Initial coats of enamel are applied with a spray, as above. At top of page, painted squares go into a kiln to have the colors baked in. Right, how the finished mural is displayed



for the enamel. First a black or dark-blue enamel coating, and then two white ones, are sprayed on and "fired" or baked in a kiln where the temperature reaches 1,550 degrees. So far, the method is much the same as the one by which your electric refrigerator gets its white enamel coating.

Now the artist has his turn. Using metallic-oxide pigments, he paints his picture upon the white-enameled metal. Once more the sheet goes to the kiln. It emerges ruby-red with heat. As it cools, the colors of the painting appear, indelibly fused into the enamel.

sample was subjected to the crushing hydraulic pressure of 70,000 pounds. They realize at last the artist's dream of a medium as enduring as a sculptor's marble or bronze.

Sixteen-gauge sheet steel serves as the "canvas" for the modern Raphael or Michelangelo who uses the new technique. Squares of the metal get a hydrochloric acid bath that pits the surface to provide a firm hold

By applying the pigment with a stencil, H. Edward Winter of Cleveland, Ohio, pioneer experimenter with the new medium, produced small designs for interior decoration (P. S. M., May, '34, p. 54). For the big World's Fair mural and two smaller panels that flank it, the coloring was applied freehand by J. Scott Williams, noted mural painter.



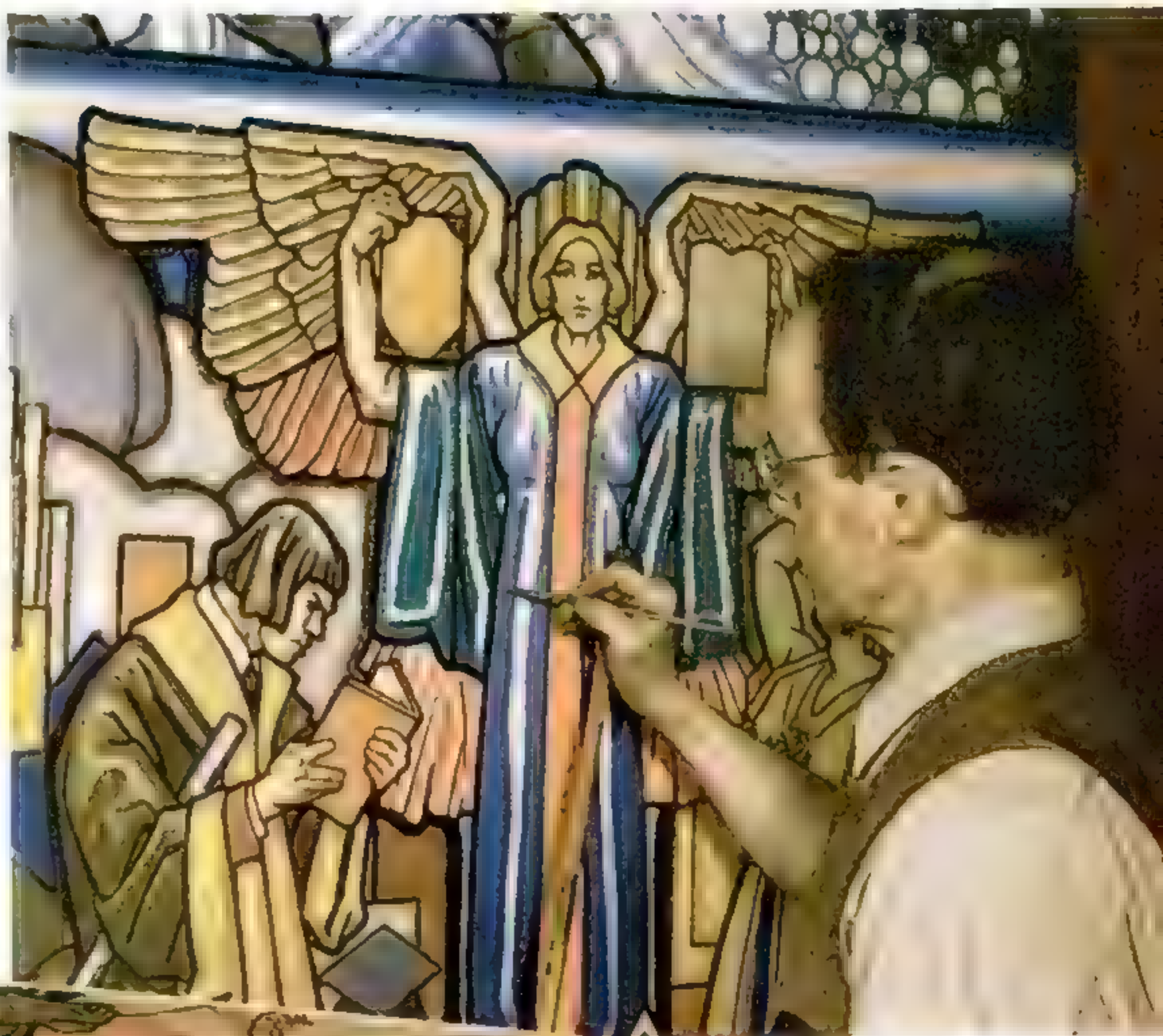
Working from small sketches, he first made a full-size outline of the design on paper. Then he cut this pattern into sections about two feet square and transferred the outline to corresponding pieces of the white-enameled metal. In applying the pigment, he used a brush for small details and a spray gun for larger areas. Then the squares went to a commercial kiln, six at a time, to have the colors baked in. If the result failed to satisfy Williams, he could touch up a square with fresh paint and send it back for another baking. When it met with his approval, each square received a final coat of acid-resisting glaze.

The whole task has taken him a year and a half to complete. As-

sembled like pieces of a picture puzzle, the squares of the main design form a curved mural seventy-two feet long and twenty-seven feet high, in which symbolic figures dramatize man's conquest of the elemental forces of nature. The smaller panels show the evolution of housing through the ages.

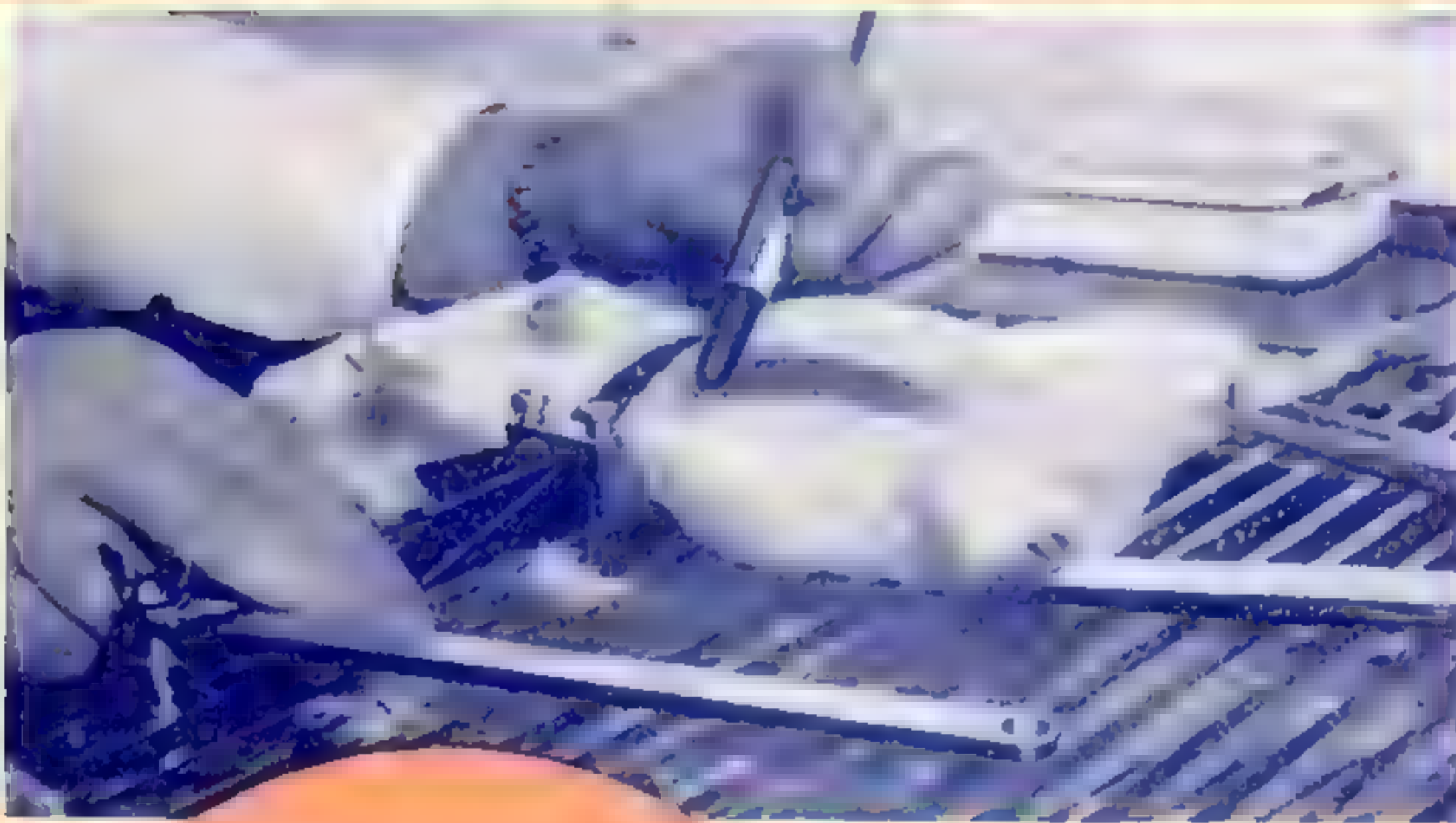
#### ART THAT WILL ENDURE

Williams working on the large color sketch which he used as a guide in painting the actual metal mural. Below, the artist is inspecting part of the mammoth mural on his studio floor





# Guinea Pigs Test



Final proof of a new cosmetic preparation is in the wearing. Max Factor, Jr., here removes cleansing grease from the face of Diane Cook, actress, before applying make-up

## GUINEA PIGS SERVE AS AIDS TO BEAUTY

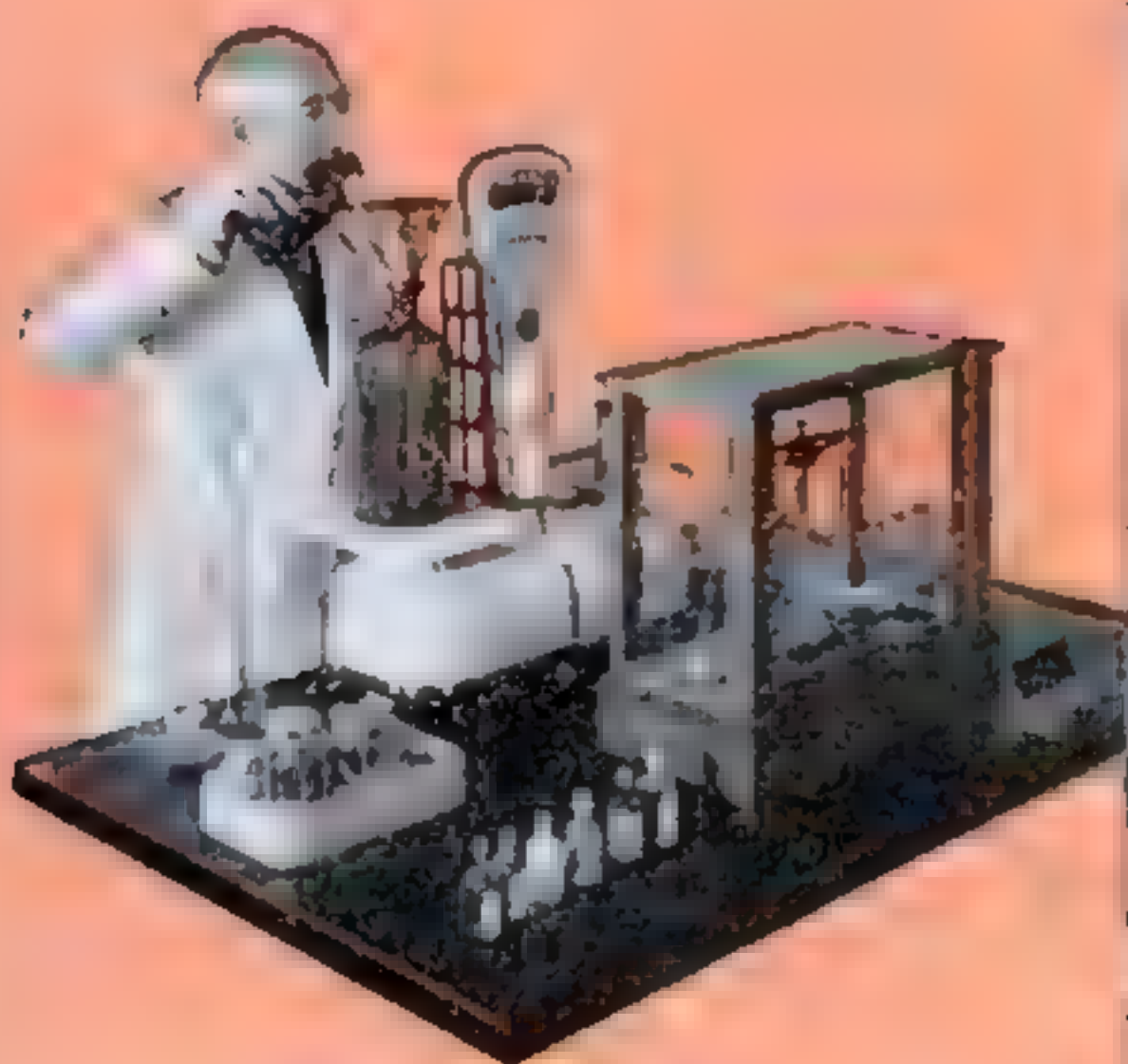
This little pig's tummy is being smeared with a new lipstick. After a few hours, its skin tissue will be examined under the microscope to reveal any irritation

Boxes of face powder moving on a conveyor in the factory production line. Thanks to careful testing and manufacture, ingredients are known to be harmless





# New Beauty Aids



Scores of chemicals and essences go into the manufacture of cosmetics. In the picture above, ingredients are being weighed carefully before mixing

**G**UINEA PIGS are partly responsible for the beauty of many of the glamorous faces that flash across the screen of your neighborhood movie theater. Tests with these patient little rodents have even saved the film careers of actors and actresses whose skin reacted unfavorably to ordinary studio make-up. Now applied to the manufacture of cosmetics for the general public, similar tests are guarding the beauty and health of millions.

It was five years ago that Dr. Paul W. Jewel first enlisted guinea pigs in the cause of beauty. As chief chemist for Max Factor, Hollywood make-up and cosmetics manufacturer, he was trying to develop an indelible lipstick that would not irritate the delicate tissues of the lips. Since then, the tests have played an important part in determining whether new beauty aids would harm the skin.

To test a new ingredient or combination, Dr. Jewel and Max Factor, Jr., director of the laboratory, take a guinea pig from one of the cages that line the room. The chemist stretches the little animal on its back on a tiny operating table, clamps it firmly in place, and runs an electric clipper through the hair

on its abdomen. To patches of the bare skin he applies the materials to be tested, reserving one area of untreated skin for comparison.

Several hours later, the guinea pig returns to the operating table. Turning surgeon, the chemist anesthetizes the little subject and removes a small section of the painted skin. A gossamer-thin slice is cut from the skin. By examining this under the microscope, Dr. Jewel can tell whether an irritating agent in the make-up material has caused a rush of white blood corpuscles to the area. If the guinea pigs O.K. the preparation, it is made up in small batches and tested on human subjects before being manufactured for sale.



Lipstick waxes and colors being mixed in a pigment mill. Manufacturing processes are duplicated in the laboratory



# Trick Dog Gets Orders by Radio



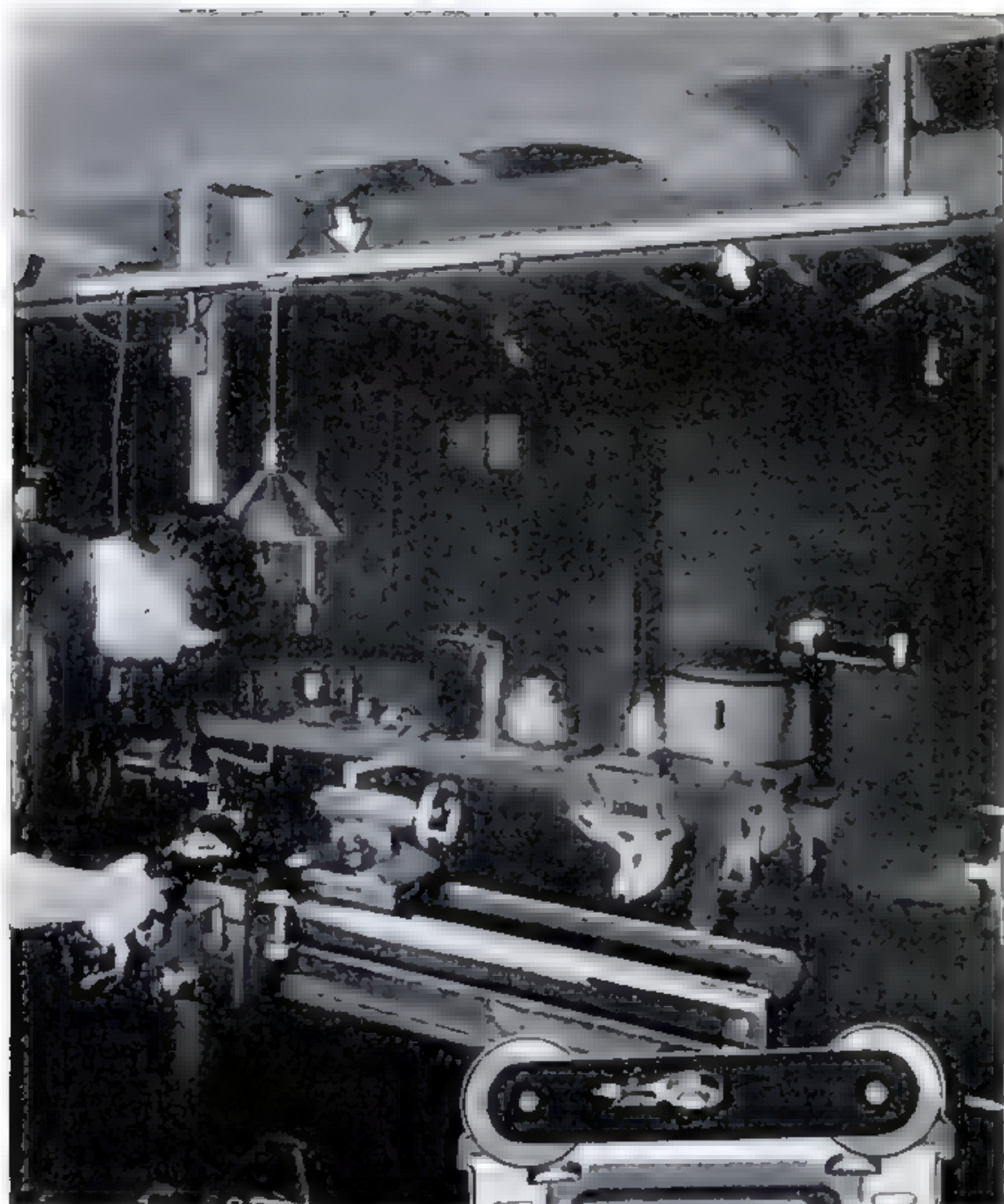
Zoe, an Alsatian police dog, listens to her master's voice as it comes from a miniature radio receiving set that is strapped onto her back. She is trained to obey radioed orders.

**B**Y TEACHING a dog to do tricks under "radio control," Constable Denholm, of the Sydney, Australia, police force, has fulfilled a two-year-old ambition. In a recent demonstration, he strapped a miniature short-wave radio receiving set on the back of Zoe, an Alsatian police dog, and retired to a shack fifty yards away. Then he spoke commands into the microphone of a portable transmitter. In response to her master's voice as it came through the ether, Zoe climbed up and down ladders, turned a faucet on and off, took off her collar, and fired a revolver.

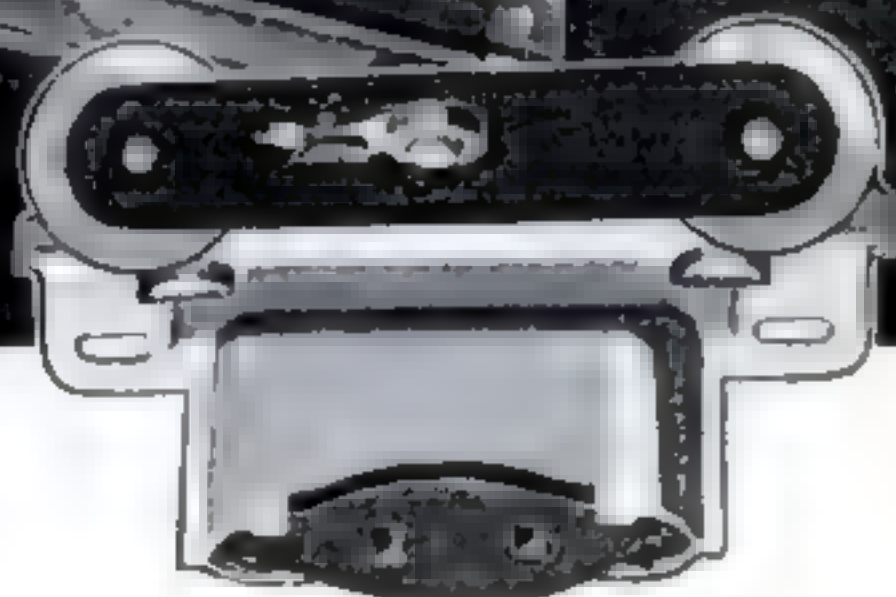


Here Zoe's master is speaking his commands into the microphone of a portable transmitting set, while the dog obeys him.





Home-workshop lathe with light and power connections to overhead trolley track



## Trolley Taps Shop Power Line

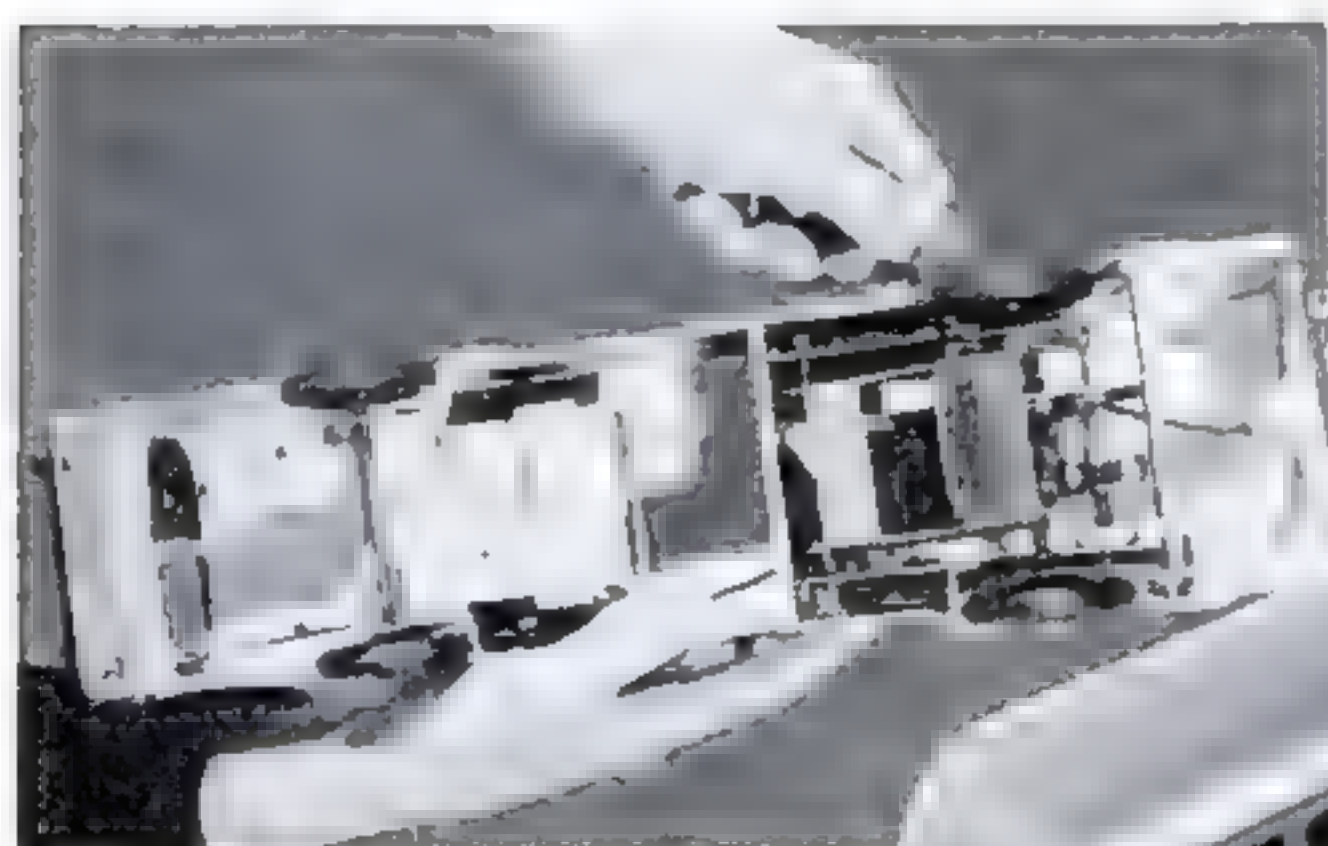
BETTER home-workshop lighting and increased working area for small electric power tools and accessories are the principal advantages claimed for a new movable wiring system. Current flows through copper bus bars in a ceiling duct which serves as a track for moving, current-collecting trolleys. Two trolley types are available. In one, wires are connected directly to trolley terminals, while the other has a receptacle for plugs.

## Simple Water Heater Run by Electricity

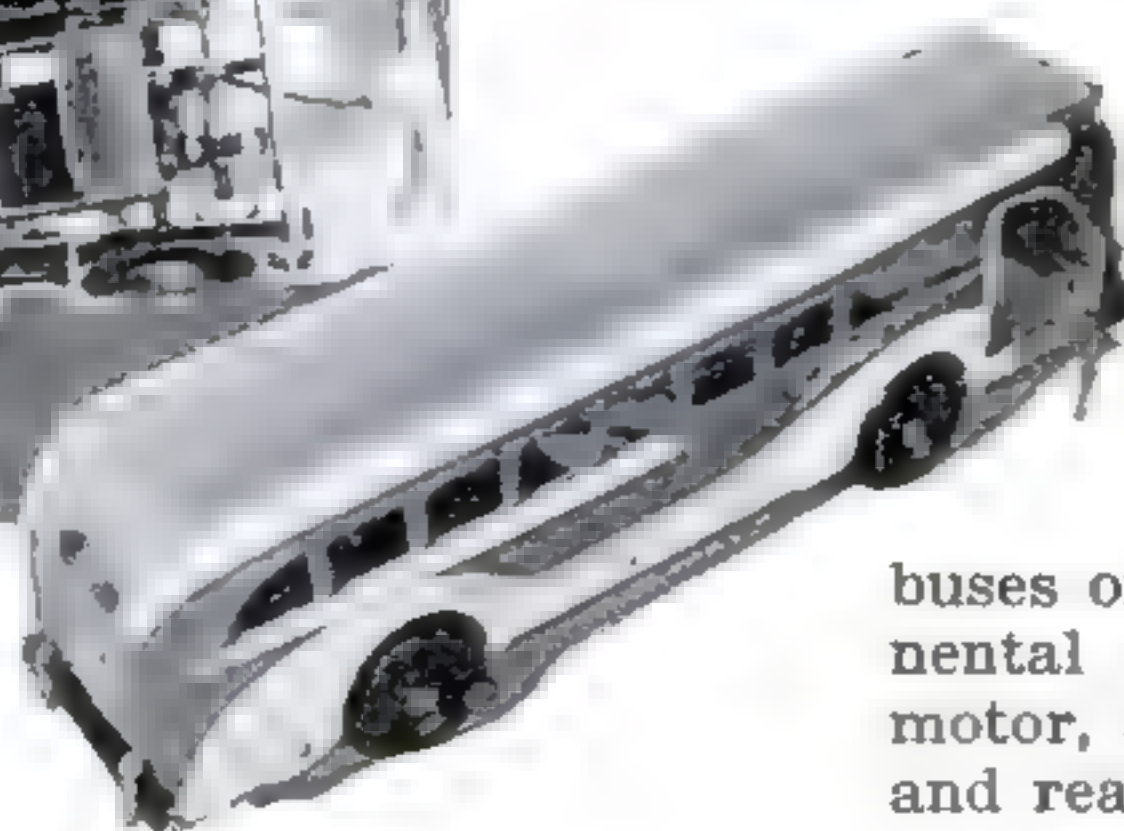
ESPECIALLY suited to summer camps and cottages, a new electric accessory for bathrooms and kitchens furnishes a constant supply of hot water. Plugged into an electric outlet and connected to a cold-water pipe, the unit has a thermostatic switch that automatically turns current on or off to maintain two gallons of water at a desired temperature. Thick mineral-wool insulation preserves the heat and gives economical operation. To install the heater, a bracket plate is screwed to the wall and the heater is fastened to it.



Easily installed, this electric unit keeps two gallons of water at desired temperature



Underside of realistic toy bus. It flashes a warning light, stops, and opens its door, as seen at the right



## Novel Toy Bus Makes Stops To Discharge "Passengers"

A NOVEL toy bus available scoots along the floor, flashes a red light rearward, stops automatically, opens its front door, waits while a bell rings, closes the door, and starts on its way again. Modeled after streamline buses of the type used on transcontinental runs. The toy has a spring motor, solid-rubber wheels, and front and rear rubber bumpers.

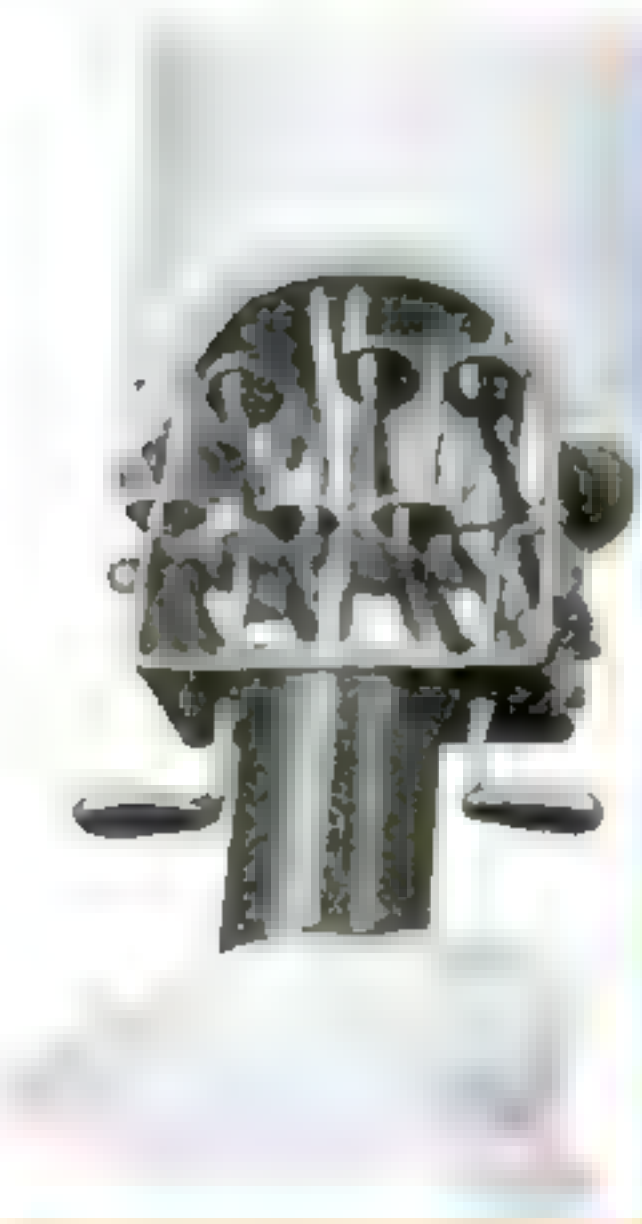
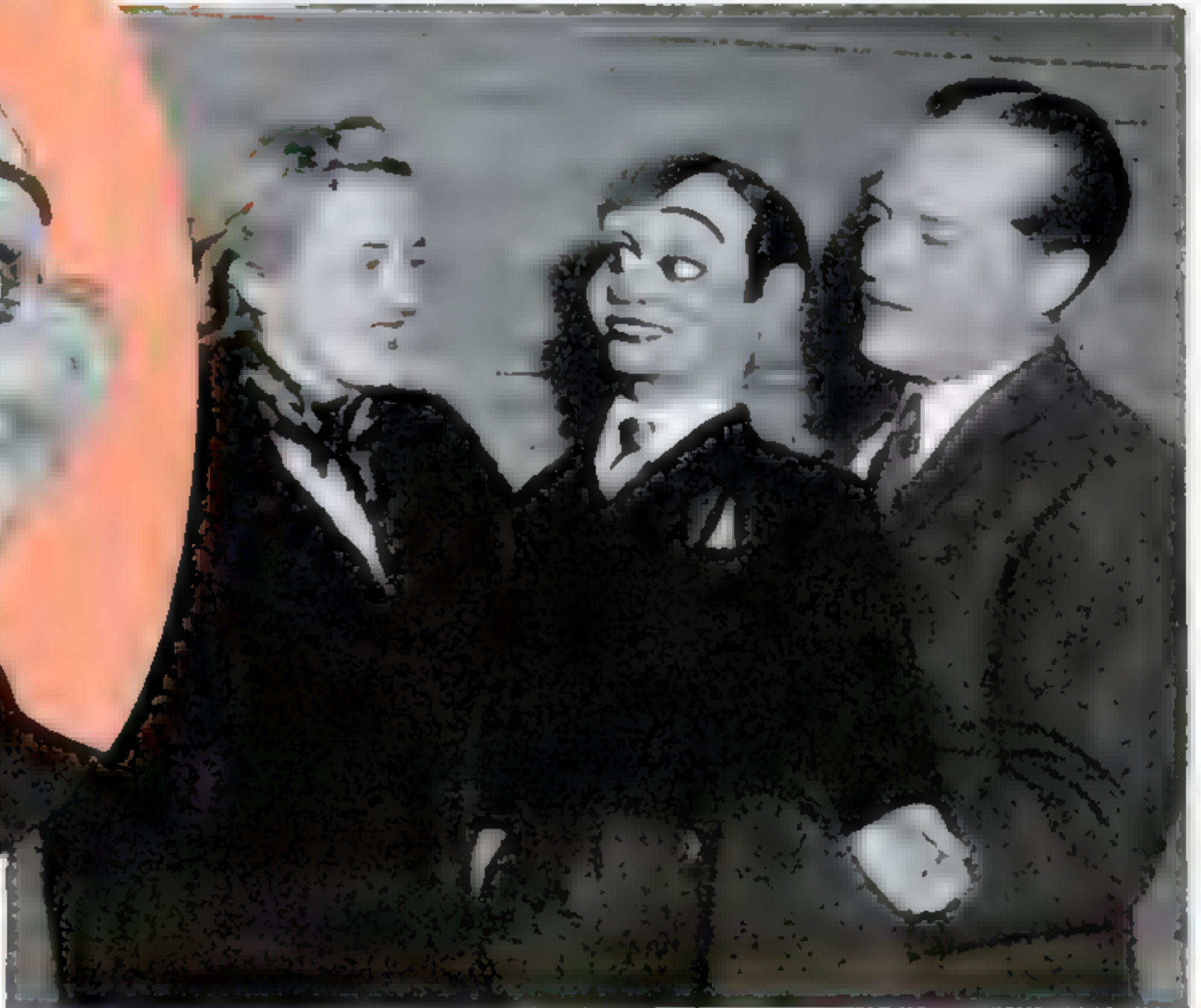


# New Dummy Is Almost Human

CHARLIE McCARTHY'S LATEST RIVAL CAN  
WIGGLE HIS EARS TO EXPRESS EMOTION



Reggie J. Treckpuss, new ventriloquist's dummy, in a jovial mood



Manipulating these keys makes him do his stuff



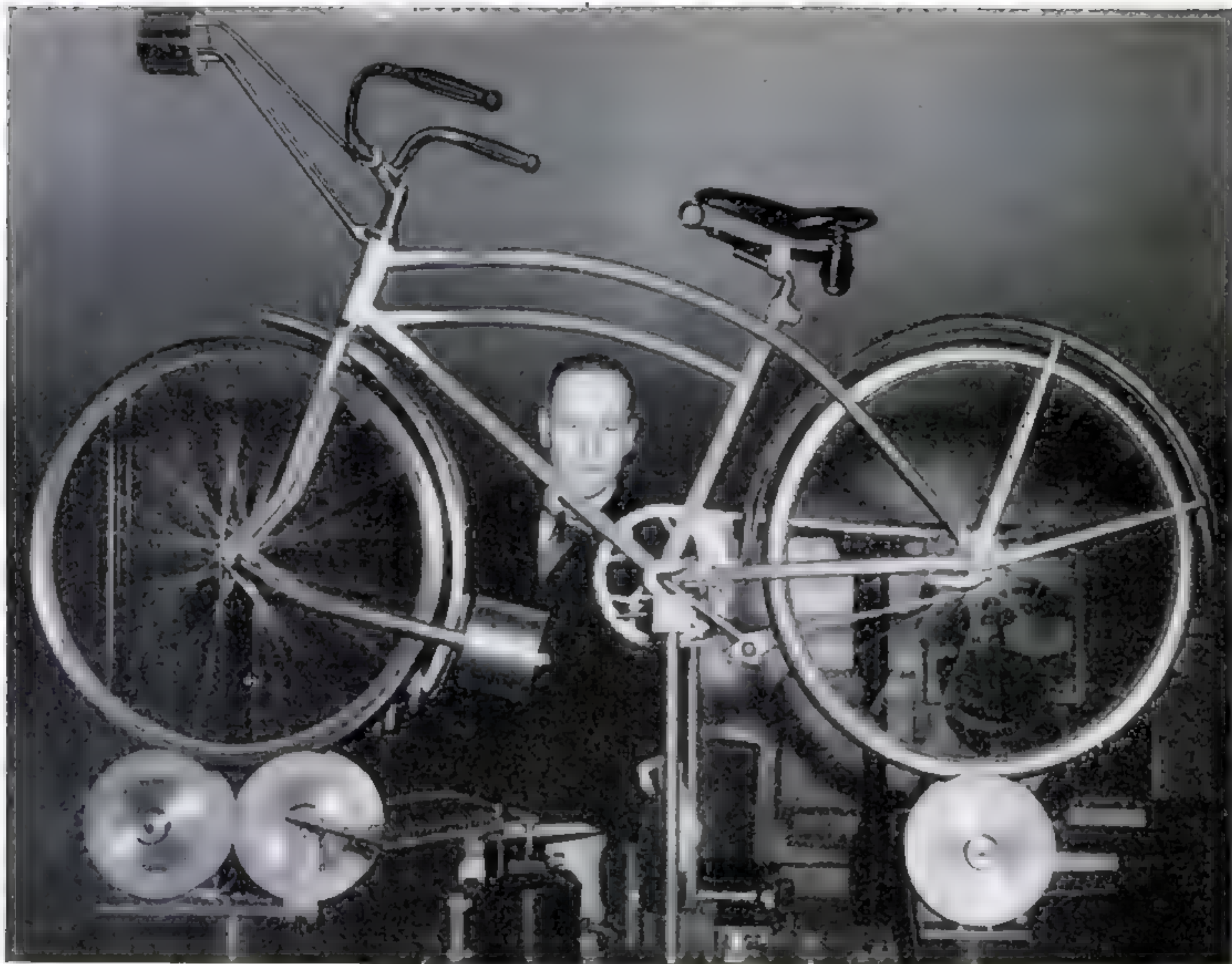
Reggie ogles a feminine admirer. The picture at left gives you an idea what he has in his mind

lid, and half closing both of his movable eyes in simulated emotion. His hair will stand on end, and batteries concealed in his head illuminate his literally bulbous nose. To control the maze of machinery in his top story, his operator manipulates a complicated fingerboard suggesting the bank of keys on

**M**EET Reggie J. Treckpuss, the latest in ventriloquists' dummies, who boasts no less than thirteen different facial movements to captivate his admirers! Reggie is a masterpiece of mechanical ingenuity. His many accomplishments include wiggling his ears, raising his bushy eyebrows or his upper lip, sticking out his tongue, lowering either eye-

a clarinet or saxophone. It took three expert craftsmen six months to create Reggie for Bob Neller, noted ventriloquist, who has just introduced him to the public in performances at Hollywood, Calif. Clothing presents no problem to Reggie, who is just the size of a six-year-old boy. He wears standard-size suits and has several changes in his wardrobe.

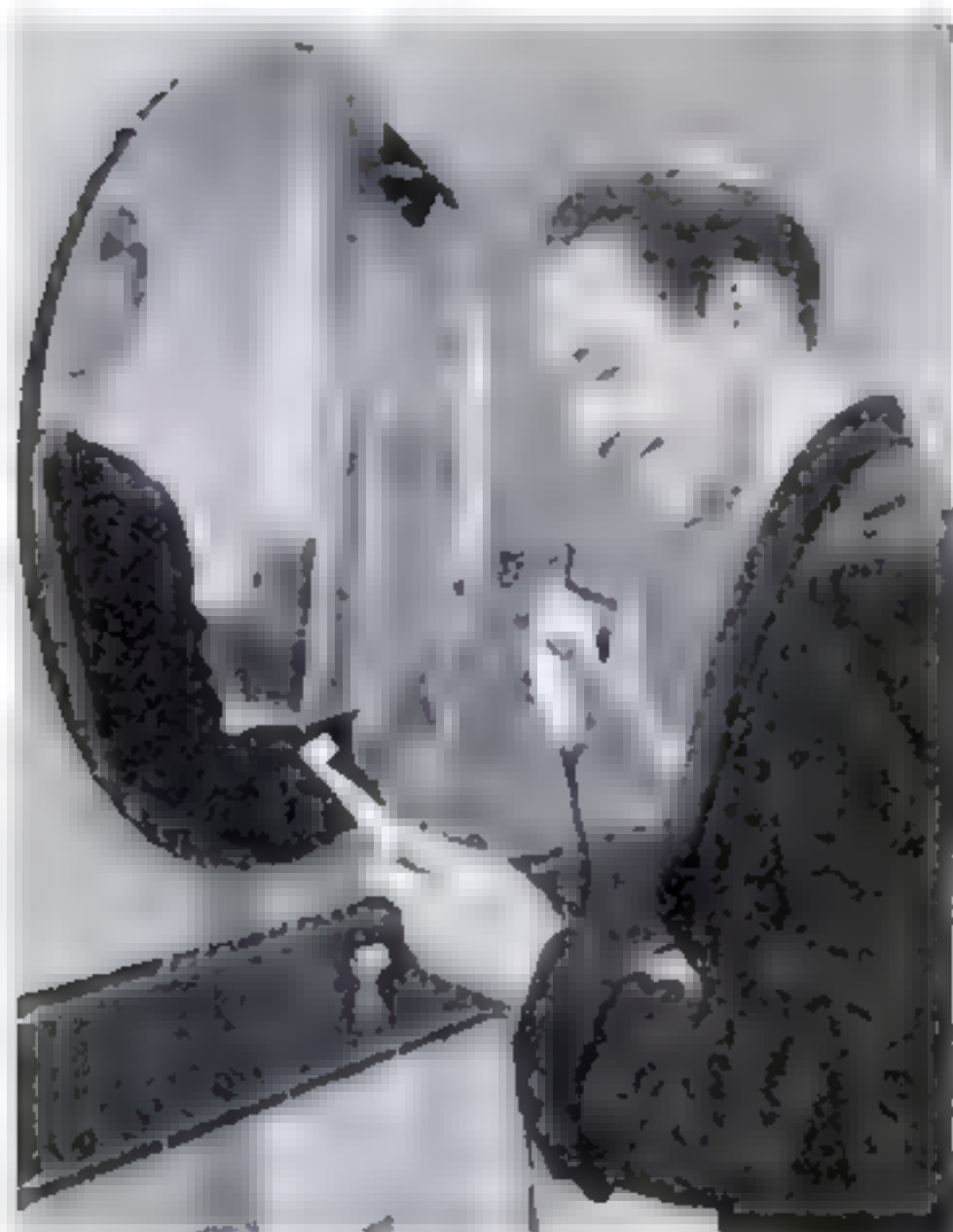




## Riderless Bike Balances Itself Automatically

A **RIDERLESS**, stationary bicycle that "travels" 400 miles a day, balancing itself on three grooved driving rollers, is one of the features at the New York World's Fair. Unsupported by wires or braces of any kind, the wheel is

balanced by means of an electric eye which notes the slightest tilting of the cycle and energizes control mechanisms that adjust corrective weights on the front mud guard and handlebars.



## Electric Razor Brushes Teeth

**TOOTHBRUSH** and razor, both electrically operated, are now available in a single unit just placed on the market. The body of the device is a small, oblong container housing an electric motor that draws current through an extension cord plugged into a wall outlet. Either a rotating brush for cleaning the teeth, or a cutting mechanism for shaving, may be inserted in the working head, which is connected to the motor unit by means of a flexible shaft.




Now it's a toothbrush, with electrically driven rotating bristles

And now it's a razor. Power comes from the motor by a flexible shaft



# HOBBYIST CREATES Modern



**A** CANTON, OHIO, man has been amazing people with the product of a lifelong hobby, a sword that withstands the exacting tests of the legendary sword of Damascus. A true Damascus blade, according to tradition, was one made in the city of Damascus, in Syria, which could be bent until the point touched the hilt without breaking, yet would retain an edge so keen that it would shave hair from the arm.

The manner in which Dr. W. Stuart Carnes pursued a hobby through many years until he succeeded, finally, in making a sword that would do just those things makes a story a bit different from the usual recital of hobby activities.

When Dr. Carnes was a boy, he was fascinated by the story of the true sword of Damascus. Many centuries ago, long before the Crusades, swords unlike any others in the world were being made in Damascus. Besides meeting the tests of bending and shaving, they were supposed to be endowed with magic powers that enabled their owners always to win in single combats and in battles. Kings sought them, and paid handsomely in gifts.

Although the details are lacking, it is known that the making of a true Damascus blade was an involved process. With the aid of oxen, strips of heated steel were drawn out into thin ribbons, while being beaten with a hammer. These ribbons were folded

back and welded together, then redrawn. In this way a steel blade of many laminations was built up. Then came the heat-treatment process, different from any heat-treatment cycle carried out in a modern factory, yet resembling it in several respects.

When a blade was ready, so the legend goes, the sword maker loaded a Nubian slave with charcoal and other equipment, and with him left Damascus at



Dr. W. Stuart Carnes proves that his modern sword of Damascus meets one of the tests of the legendary weapons. At right, shaving hair from the arm





# Swords of Damascus

By Walter E. Burton

midnight and traveled east into the desert. He directed the slave to kill animals and make bellows from their skins, to be used in pumping air. Then, on another midnight, the sword maker had the slave build a fire of charcoal made from gopher wood, using the animal-skin bellows to keep it going. In this fire the sword was laid, the point toward the east. Then the slave pumped the bellows until he was ready to drop from exhaustion—until "his blood boiled," as the story goes. When the blade matched in redness the color of the rising sun, the sword maker seized it and plunged it into the heart of the slave, tempering the steel in living blood. He withdrew the blade, and swung it around above his head while uttering an incantation. Three times he did this; then with the blade he severed the head from the body of the slave. If examination



The amateur sword maker also collects rare weapons. This Japanese blade has a keen, hard edge welded onto strong, tough steel

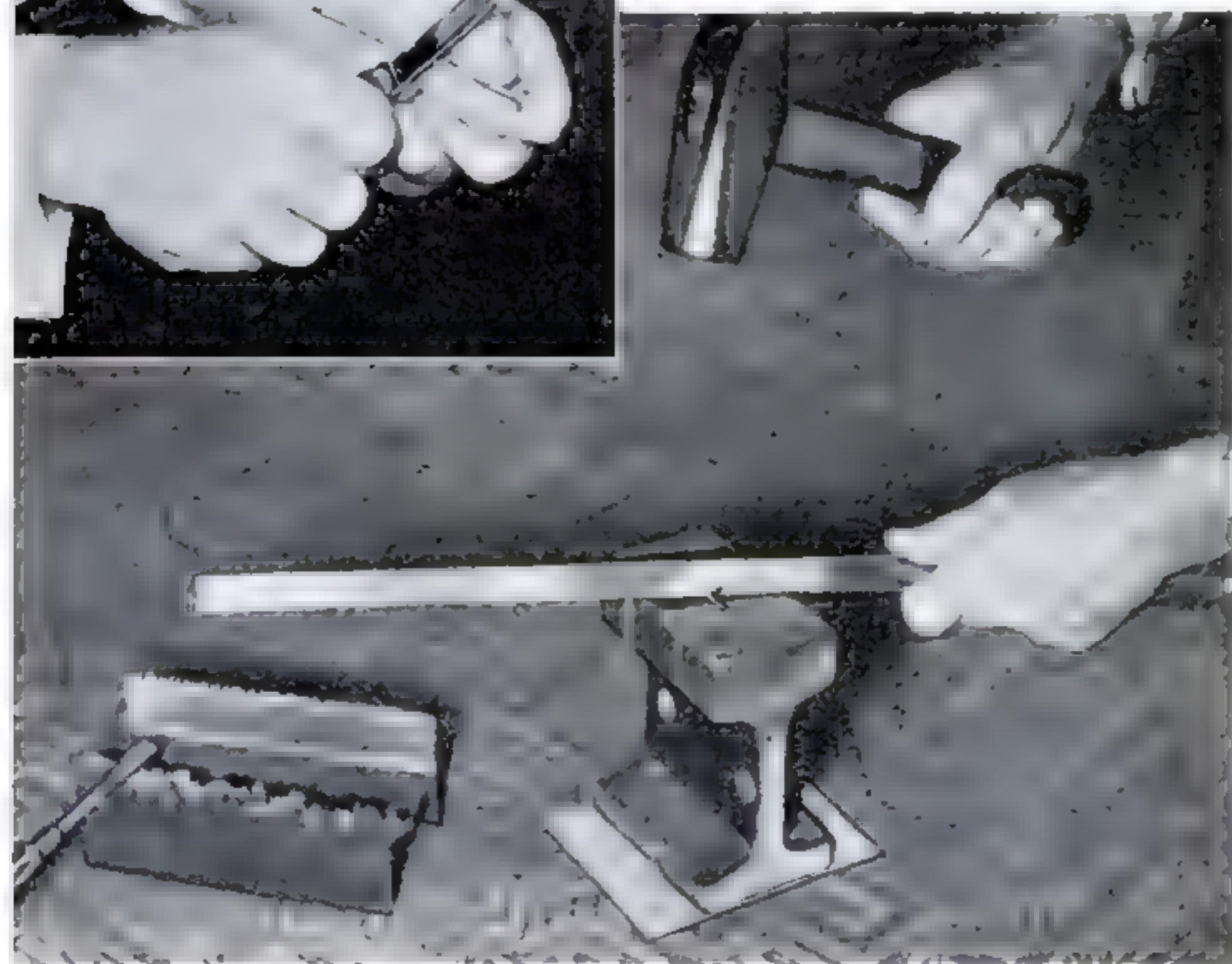
of the steel showed no nicks, and tests proved it to be adequately flexible, the sword expert returned triumphantly to Damascus to sell the blade to some king for a fortune in jewels.

Dr. Carnes, in his research, was handicapped by the lack of Nubian slaves; but he had, instead, vanadium and a knowledge of metallurgy that enabled him to duplicate some of the processes involved in the ancient tempering ceremony. The Damascus sword maker, in using human blood, was getting results that can be duplicated today with brine at body temperature. The swinging of the blade through the air while reciting incantations was merely a process of air tempering, the reciting providing reasonably accurate timing. By comparing the redness of the metal with that of the rising sun, the craftsman was merely using a standard for judging the temperature of the steel.

It was many years before  
(Continued on page 230)



Whittling a nail with a pocket-knife. Below is a sample strip of steel tempered in sections to various degrees of hardness





# Setting-Up



These babies at the New York Foundling Hospital are being given an exercise to develop neck, back, and abdominal muscles. They range in age from five to six months.



At three months, a baby is placed on its stomach for a period each day. The infant raises its head naturally and in so doing strengthens its neck and abdominal muscles.



"Cycling," designed to strengthen thigh and calf muscles, is given babies up to five months old. Gently but firmly, the tiny legs are flexed repeatedly over the abdomen and then straightened.

Who's afraid? Certainly not this little fellow. Self-confidence is instilled into infants between three and five months old by this stunt. The nurse's hand supports the breastbone and ribs.



# Exercises for Babies

**M**OTHERS of a generation or two ago, who swaddled their infants in a dozen petticoats, harnessed them with bellybands, and kept them quiet with various soothing concoctions, might be alarmed, but the bright-eyed babies who have the good luck to be cared for by the Foundling Hospital in New York City, thrive on the hearty setting-up exercises pictured in the photographs on these pages. Designed by child specialists and administered by smiling, white-capped nurses, these cradle calisthenics are aiding nature to build the strong muscles, supple bodies, and lusty lungs that mark the healthy infant.

Starting at the age of three months with simple exercises that involve little more than spontaneous kicking, arm-waving and toe-wiggling, the muscle-building movements increase in complexity as the children grow older, progressing through leg-stretching and knee-flexing to such impressive exercises as the "wrestler's bridge" shown below. At ten months, the youngster is ready for the big moment pictured at the right, when he is encouraged to make his first effort to walk.

Established just seventy years ago, the New York Foundling Hospital cares for neglected and abandoned children from three of the city's five boroughs, and has given thousands of infants a healthy start in life.



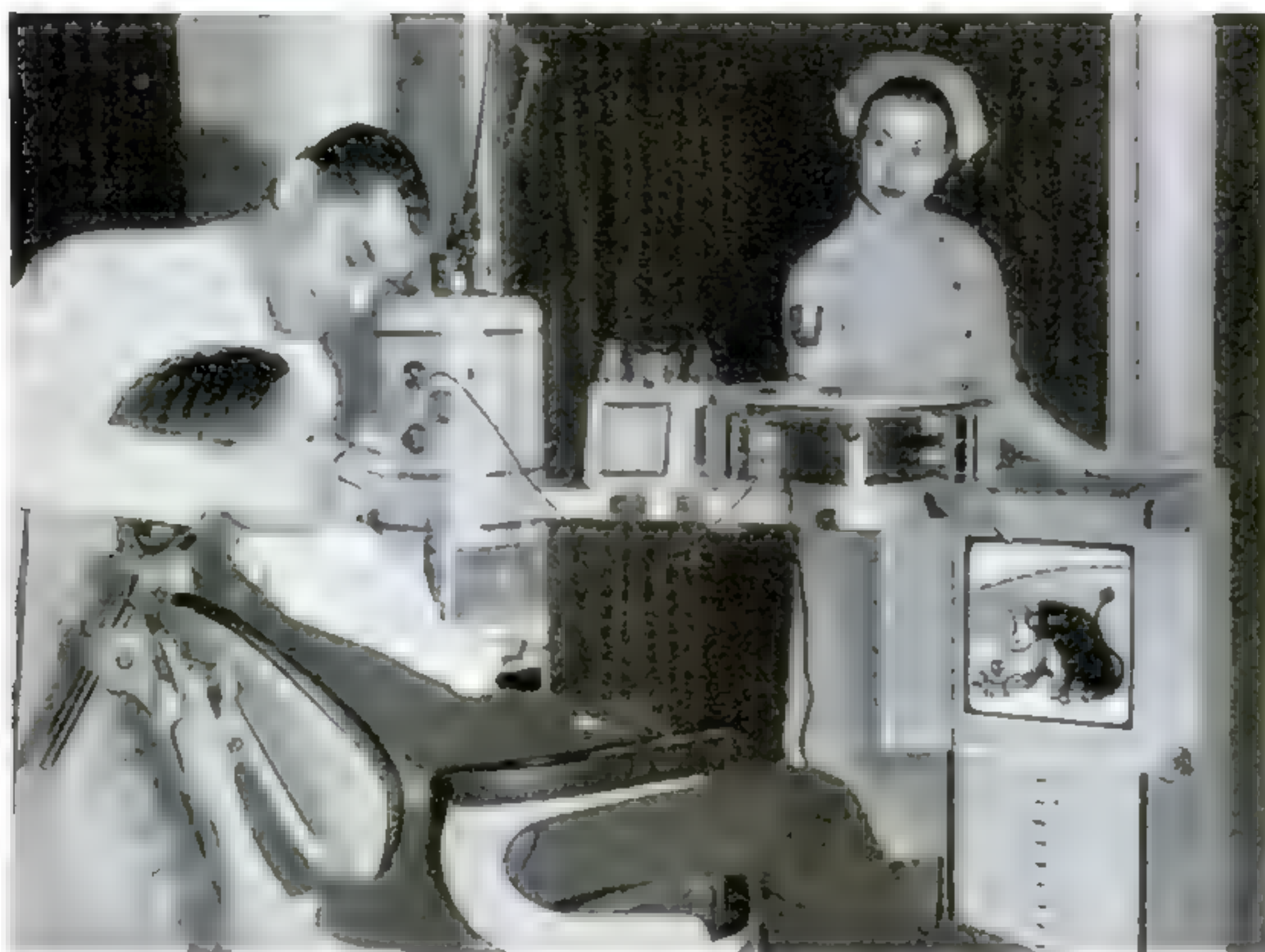
The first step! At about ten months comes the big moment when Baby is supported by the hands and encouraged to make a first effort to walk



Babies six months to a year old do the "wrestler's bridge." Wouldn't Grandmother have a fit if she saw this?



# Movies Lure Youngsters to the Dentist



INSTEAD of staring at the wall and wondering how soon the ordeal will be over, young patients of Dr. Harry Spiro, Chicago, Ill., dentist, can concentrate their attention on moving pictures that flash in front of them, while the dentist works on their teeth. Designed to make the dentist's office a more popular place with youngsters, the apparatus is housed in a cabinet placed directly in front of the dental chair. Film cartoons and short features are thrown onto the screen by a small electric projector.

Watching movies on the small screen keeps the patient's mind off his troubles

## Typewriter Artist Produces Pictures Like Tapestry

PICTURES that resemble tapestry are produced with a typewriter by Rosaire J. Belanger, a mill worker in Saco, Me. Belanger first draws a pencil sketch on a sheet of paper, then inserts it in his typewriter and fills in the sketch with various characters to produce shading and outlines. With carbon paper, he transfers the picture onto graph paper, and copies it on blank paper.



George Washington, as pictured with a typewriter by Rosaire J. Belanger. At left, the artist at the keyboard





## Phone Device Lets Secretary Listen In

WITH a new "eavesdropping" earpiece attached to his receiver by a tube like that of a doctor's stethoscope, an executive can have his secretary listen in during an important telephone conference or business deal. Thus she can take down exactly what is said by each party in the course of the conversation, and a permanent record is made available for future reference whenever it is wanted.

With this unit a secretary can take down a two-way telephone conversation

## Razor-Blade Drier Protects Towels

WHEN you've finished shaving, just pass the rinsed blade endwise through a slit in a handy new blotting pad—and presto, it's dry. Absorbent flannel removes all the moisture from the blade, and avoids the danger of cutting fingers or towels. The razor-blade blotter is declared to last for 365 shaves or more.



Left to right: The wet razor blade goes into the drier, passes between the two pads of absorbent flannel, and comes out wiped clean and dry

## Freight Plane Has Hinged Cargo Fuselage

ENGINEERING work on a "flying box car," called the first airplane of basic freighter design developed in this country, is nearing completion at a Chicago, Ill., aviation factory. The whole rear part of the fuselage, with the

tail, swings aside on hinges to give unimpeded entrance to bulky cargoes. Important military possibilities are foreseen for the craft's ability to carry small tanks and trucks, as illustrated in the artist's drawing below.

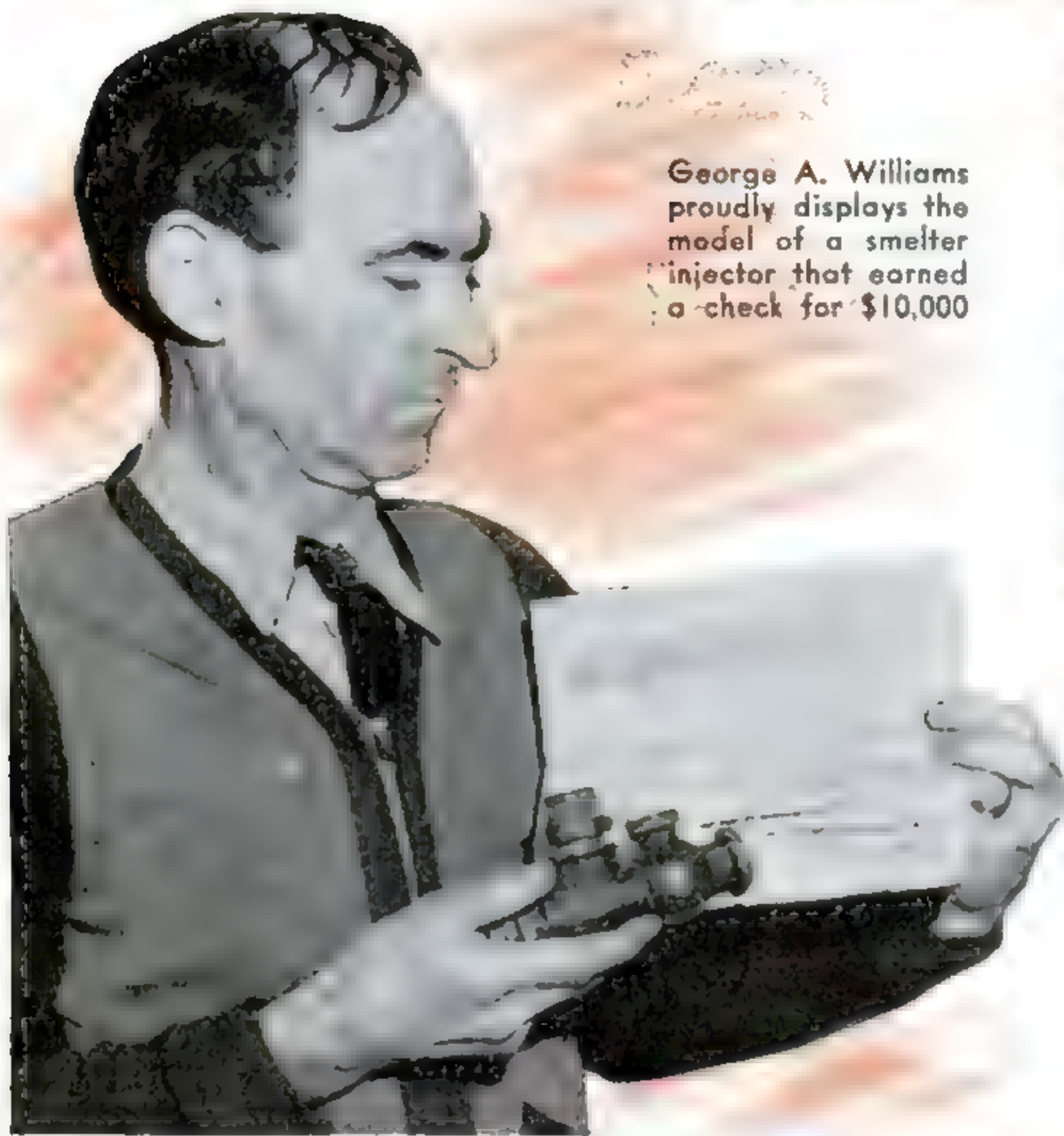


How the huge freight plane's fuselage is hinged to permit bulky cargoes such as small tanks to be loaded



# Spare-Time Inventor

## TURNS IDEAS INTO DOLLARS



George A. Williams proudly displays the model of a smelter injector that earned a check for \$10,000

standing alongside his workbench with a large rubber vacuum cup pressed against his face. At his feet stood a square cabinet in which I heard the whir of the motor and the suck-suck of the pulsator.

He removed the cup, and I saw full-bodied puffs of steam escaping. I sniffed the steam. Lemon-verbena leaves! In this single unit, he has combined heat, medication, and vacuum for drawing blood to the body's surface. But the vacuum prin-

ciple has another application. By a quick change, Williams installs a massaging piston which slaps the body 485 times a minute with a round piece of wood as the air rushes in and out of the hose.

Williams's resourceful mind turns to practical account many personal experiences. By day, this fifty-seven-year-old experimenter heads the California supply department for the Western Union Telegraph Company. Seldom does

a night pass when he spends less than three hours in his workshop, turning down and boring plastic cylinders, improving upon old inventions, working out new ideas.

Some inventions spring from his mind in the form of a model after years of study. Others pop up in a few minutes. While observing the then costly and slow reduction of

**O**N A frigid winter day in 1910, George A. Williams stepped carelessly in front of a six-inch pipe connected to an air compressor he was installing for a smelter at Salt Lake City, Utah. The vacuum pull caught him by the pants and pressed his thigh so firmly against the opening that not until the pulsations tore a piece of cloth and broke the tremendous suction was he able to escape.

Flash forward a quarter century, and you see the same man, now a veteran telegrapher and part-time inventor, still pondering that uncomfortable incident, wondering how he can convert those pulsations into a healing force. He is puttering in a bungalow workshop at the rear of his Los Angeles, Calif., home, installing an electric motor; a pulsator, which is an air compressor minus check valves; and an electric hot plate.

Three more years elapse, and recently I found Williams, who during off moments since backing up against the compressor intake has turned out 103 inventions,



Sprinkler heads for garden hose. The one at the left is inserted between sections of hose, the other at the end



copper in a Utah mill several years ago, he devised an injector which shoots ores and coal dust into the smelter furnaces at the turn of a hand. His invention won him a \$10,000 check from the smelter.

The injector took several years of study. But when a salesman of chair glides, the oval metal heads which permit furniture to slide around a room without marring floors, asked him if he could turn out a new idea along this line, Williams replied, "in about three minutes—for \$1,000 and a half interest in the business."

His visitor thought the inventor was joking, and accepted the "proposition." Yet within three minutes, Williams roughed out a sketch combining a rubber tip shaped like a man's hat, which is fastened to a chair leg with a nail, and the metal glide which is pressed into the rubber crown. It was patented, and the inventor was richly rewarded.

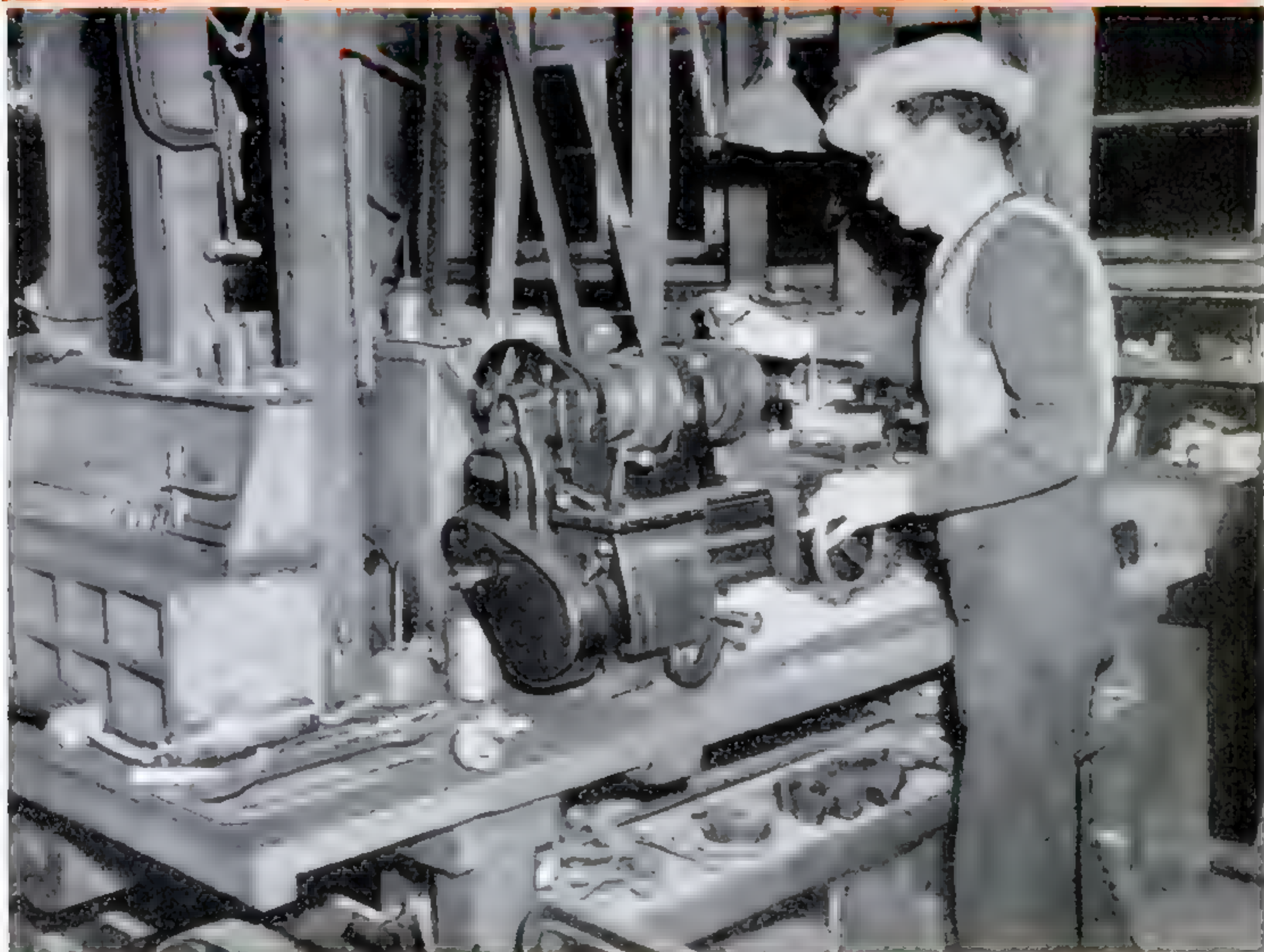
"Will it work, and will people want it?" is his acid test for each new device. Not long ago he carved a slip device which holds

a necktie in place without tying. "Makes a fellow look like a hillbilly," he confided, "but, hell, they'll wear anything nowadays."

Incidents you and I would pass with scarcely more than momentary notice start a thought in Williams's mind. Soon it comes out as a full-fledged invention.

Recently his lodge elected him chairman of its motor-safety committee. Williams accepted the honor, and the next night he pondered a forthcoming speech on "sudden death" and "insane drivers." But the speech never materialized. Instead, he shortly found himself fastening a flash-light battery and two bulbs on the back of a leather glove. In a single night, he perfected the glove signal. Electricity from the six-volt dry cell is fed to the lights, one red and the other white, which are mounted on the first and third fingers. The switch is located on the back of the forefinger, and may be operated by the thumb of the same hand. By this simple application, he avoided mechanical operation, and by hand movements alone can flash signals seen

By  
**ANDREW R.  
BOONE**



Here the part-time inventor is seen at a lathe in his back-yard workshop, where he spends about three hours every evening. He has \$8,000 worth of machinery, all paid for with the proceeds of his inventions



for 200 yards. When his car balks, he disconnects the red light, and uses the white one as a trouble light.

During a recent dry spell, Williams was watering his lawn daily, and grumbling over the time consumed when he might well be inventing something.

"Why not install a sprinkler system?" asked his wife, one evening.

Williams thought about that question a lot

during the next few days. "Underground tubing and outlets are expensive," he decided. "Why can't I place the whole sprinkling system on top of the lawn?"

He answered his own query by devising a sprinkler head containing only two parts, fitting it with male couplings and installing a series of the heads twenty-five feet apart in his hose. For good measure, he threaded the heads from top to bottom. Now he can adjust the head from the top, when it is used on the lawn, or from the bottom when it is rigged in an overhead sprinkling system.

Conversation in the Williams household usually centers on his inventions. He is the man who does the work and turns out models, yet more than one device has sprung from the minds of his two sons and his daughter, Dorothy. Mrs. Williams watches the business side, making sure that his hobby is turned into dollars whenever possible.

"Women carry too much junk," Dorothy remarked one evening, displaying her bulging purse. She held forth her lipstick and rouge containers. "These ought to be in a single double-end tube."

When Dorothy returned, some hours later, she found him boring out a short length of round plastic material on his lathe.

"I think I've got it," he told her.

"What?"

"Lipstick and rouge container, with a space



Dorothy Williams, daughter of the inventor, using a handy tube that holds lipstick in one end and rouge in the other end

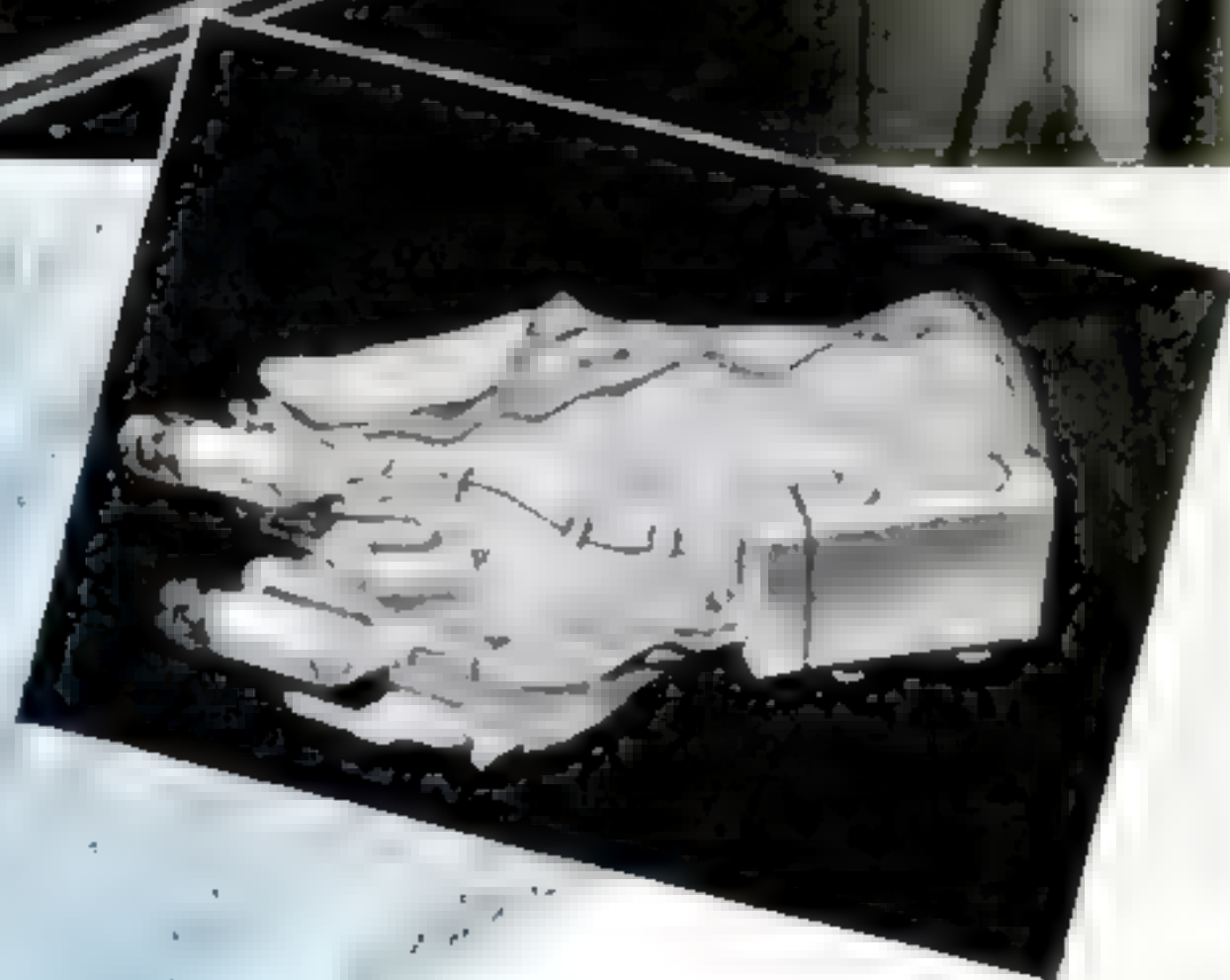
By shaking ground clay from the desert through a fine silk screen, Williams produced an emulsion with medicinal value







An accident that occurred twenty years ago suggested this unusual therapeutic machine. It produces medicated vapor combined with vacuum, and can also serve as a massage unit as seen below.



Asked to make a speech on motor safety, Williams invented this signaling device for drivers instead. A dry cell supplies current to light bulbs, one white and the other red, on the fingers.

for a reserve supply of rouge in one end."

He had it, too. A couple of days later he completed the device, filled it, and presented it to his daughter. By sliding a single metal guide, projecting from a slot, she ejects the lipstick from one end and the pad of rouge from the other. Screw caps protect her purse against the colors when they're not in use.

In his workshop, filled with \$8,000 worth of machinery paid for by his part-time inventions, you will find many interesting products. When tired of working on a new idea, he whittles. In three hours he turned out a shotgun in a cage, all carved from one piece of wood from an old broomstick. He

took seventy-two hours to turn out "patience and skill," an intricate design whittled with razor blades. Or he may apply the sharp blade of his knife to achieve a group of animals in relief.

His interests run in many directions. Years ago he found a deposit of clay on the desert, and decided he could produce certain salts from it as an emulsion. So he built his own agitator, obtained a square of 200-mesh silk screen and shook that clay until it fell through in particles invisible to the eye. Experimenting with various combinations of chemicals, he finally achieved an emulsion which now is used in treating certain diseases.

Everything, Williams believes, is a force for good or evil. Oil in manzanita and ironwood, for example—trees found on the southwest desert. It happens that bugs and ants infest these woods, and so the inventor figures the oil must benefit them either as food or medication. He now is studying samples of manzanita, attempting to extract that oil.





## A Weird Warrior of the Future?

**W**EARING a grotesque-looking mask, the fantastic figure above might easily be mistaken for a soldier in some grim war of the future. Actually, he is a worker in a

pug mill where clay is mixed for making bricks. The mask and goggles protect him against silicon-filled dust, which otherwise would destroy his lungs and eyes.



## Rabbit Killers Walk Backward

SHOOTING, with no limit to the kill, is offered to hunters in Utah who form themselves into groups of hundreds to rid farming areas of hordes of jack rabbits and cottontails that ruin food crops and spread spotted fever, a dreaded cattle disease. Moving from one ranch to the next, the hunters form a wide ring around a rabbit-infested area, and close in, driving the rodents before them. When they sight fellow hunters on the opposite side of the circle, they turn and continue their march toward the center, walking backward. As the penned rabbits break out through the tightening chain, the gunners shoot them down. Although purposely ruthless, this method is more humane than the practice of beating the rabbits to death with clubs.



Walking backward in a narrowing circle, hunters shoot escaping rabbits

## Wishbones Made Her Dreams Come True

Miss Delphine Binger at work, and some of the novel tokens she fashions from wishbones



SCRAPS from a thousand Sunday dinner tables form the raw materials for a novel and thriving industry built up by Delphine Binger of New York City. Miss Binger collects the wishbones from turkeys, chickens, and other poultry, treats them by a special electrical and chemical process, inscribes them with special greetings, dresses them up with ribbon bows and sprays of artificial flowers, and sells them as decorative good-luck novelties to accompany

wedding, birthday, and graduation presents, and gifts for other special occasions. Among her specialties are wishbones bearing tiny stethoscopes for medical-school graduates.





# News from the



Frogs aid scientists in the study of the chemistry of vision

## Frog Eyes Yield Rare Chemical

FROGS' EYES have supplied scientists at Columbia University, in New York City, with experimental quantities of the amazing chemical compound known as visual purple. In the eye, this compound plays a part similar to that of the sensitive emulsion on a photographic film. Found in the retina, or membrane in the eye which receives the image, the chemical compound is ordinarily purple. When struck by light, it becomes colorless. Then, after it has responded to the image projected on it, it resumes its purple hue again. At the Columbia laboratories, Dr. A. M. Chase and his associates have, for the first time in history, watched this compound changing color in a test tube.

## Operating on the Heart

SURGICAL life saving now includes a delicate operation on the heart itself to relieve the pain of angina pectoris. In this cardiac affliction, the arteries which normally carry blood to the heart become blocked. Dr. Samuel A. Thompson, of the Flower-Fifth Avenue Hospital, in New York City, recently reported a new method of operation. Arteries normally supplying blood to the heart are tied off and the sac which surrounds it is made to adhere to the cardiac muscles so its blood vessels take the place of the arteries.

## Medicine Planted Under Skin

PLANTING powerful chemical tablets beneath the skin to provide vital secretions needed by patients suffering from gland deficiency, is foreseen as the result of researches by two English physicians. At the National Institute of Medical Research, Dr. R. Deanesly and Dr. A. S. Parkes have succeeded in producing remarkable results in experiments with animals. Into incisions made in the skin, they slip small tablets of

pure crystalline gland chemical, then sew up the cuts. The chemical is gradually absorbed by the bloodstream just as though it was coming from a living gland. Later on, the remains of the tablet is removed and weighed to see exactly how much has been absorbed. So far, only sex-gland chemicals have been used in the experiments. But secretions in crystalline form from the thyroid, the pituitary, and other vital glands are expected to be employed in the future. The new method gives the body a steady supply instead of a series of small doses administered by mouth or hypodermic injection, as in the past.

## Serum Deadens Extreme Pain

THE history of medicine is the story of an unending battle against pain. One of the latest advances of the medical battle line was reported to the French Academy of Sciences, in Paris, when Dr. Robert Hirsch explained his method of injecting acidified blood serum into the veins of patients to stop pain too severe for even morphine to control. Lactic acid, which is formed by bacteria when milk turns sour, is added to sterilized blood serum and the mixture is injected drop by drop into a vein. This sudden upsetting of the alkali-acid balance in the sufferer's body is said to bring relief. Ascorbic acid, which is another name for vitamin C, is also used by Dr. Hirsch. In addition to giving relief from pain, the treatment is reported to have proved successful in halting dangerous bleeding.



Chemical tablets put under the skin make up for gland deficiencies



Acidified serum is injected to relieve severe pain



# World of Medicine

## Laxative Shortens the Spine

AS THE result of taking a saline laxative daily for thirty-five years, a patient in Denmark shortened his spine four inches. The laxative kept lime salts in food from being absorbed by his body. To compensate, his system took lime, bit by bit, from his spine and other bones.

## Mistletoe Lowers Blood Pressure

MISTLETOE, the magic plant of the ancient Druids, is now being used to relieve the suffering of patients afflicted with high blood pressure. At a clinic in Vienna, Germany, Dr. Ferdinand Mattausch has used a preparation from mistletoe growing on apple trees in treating more than sixty patients successfully. Within from four to six weeks after prescribing the mistletoe medicine, Dr. Mattausch found his patients showed reduced blood pressure, slower pulse rate, and improved arterial circulation.

## Coming Storms Cause Headaches

"STORM HEADACHES" and "low-barometer insomnia" have been brought to the attention of the American Medical Association by Dr. Dan Tucker Miller, of St. Louis, Mo. Preceding every storm, susceptible patients suffer from sleeplessness or headaches. The low atmospheric pressure or the barometric "low" is thought to be the cause of these bodily disturbances.



Some persons suffer from headaches or insomnia as barometric pressure falls

## New Skin-Grafting Technique

NEW HOPE for those disfigured by accident or disease is held out by a skin-grafting technique recently outlined in "The American Journal of Surgery" by Dr. Maxwell Maltz, of New York City. It is the latest improvement in a surgical art more than 2,500 years old and involves the use of skin from the arm of the disfigured patient to provide ma-



Living skin from the arm is grafted onto the face

terial for the plastic surgery. The arm is held against the face until the flap of skin has grown in place. Instead of using a flat flap, the surgeon shapes it into a tube, following the technique developed by Sir Harold E. Gillis, head of the plastic-surgery division of the British Army. This tube nourishes itself with its own blood. Dr. Maltz's discovery is that by attaching the graft skin-side down instead of flesh-side down, he can obtain better results. Eventually, the skin comes to the surface, making a smooth joint at the edges of the scar. In previous methods of skin-grafting, in which the flap was placed flesh-side down, ridges or bevels often marked the boundaries of the graft.

## Easy Test Diagnoses Brain Ills

BRAIN ILLS are now being diagnosed with the aid of a test tube, according to recent word from Frankfort, Germany. At the Frankfort University Clinic for Mental and Nervous Diseases, Dr. H. Lehmann has conducted more than 1,000 experiments to prove the truth of his theory that mental troubles arising from the disintegration of certain brain substances can be discovered by a simple chemical test. A small quantity of cerebral fluid is drawn from the brain cavity of a patient and placed in a test tube holding normal cerebral matter. If the patient is suffering from insanity produced by the disintegration of brain substances, the fluid in the test tube becomes cloudy. From seventy to eighty percent of the inmates of insane asylums are said to be victims of such insanity. The new method is expected to provide a quick and accurate means of diagnosis, insuring proper treatment.



# Lifelike Movie Puppets



A scene from the puppet movie—the race between the hedgehog and the fleet-footed hare



Here one of the producers of the animated picture is shown inserting a new mouth in a character, making it unnecessary to substitute a new puppet to portray a change of expression

**L**IFELIKE puppets, that change their expressions realistically, replace the usual drawn cartoon figures in a new animated movie depicting an old-time fable in which a nimble-witted hedgehog plots with his wife and wins a race with a fleet-footed hare.

When puppet movies of this type were attempted in the past, it was necessary to create hundreds of different models of each character to take care of the animation; one model being substituted for another as each frame of the movie film was exposed. For this picture, the producers devised an ingenious system of removable eyes and mouths to obtain the desired effects. As a result, simply by substituting different features, the puppet actors were made to register every emotion and even move their lips in accompaniment to voices on the sound track.

To produce the animated movie, clay models of the heads of the characters were first made. Then plaster duplicates were cast and provided with the necessary openings to take the removable eyes and mouths. The



# Act Out Ancient Fable

bodies, arms, and legs of the puppets were made flexible so that they could be bent and adjusted to assume various positions.

In the actual filming, the process used was similar to the "frame-by-frame" method employed in making the conventional animated cartoon. With the puppet characters in the desired positions and fitted with the correct expressions, a single frame of the movie film was exposed. Then, with the characters altered to agree with the animation, the second frame was exposed, and so on.



Note the eyes and mouths in foreground of the picture above. Each mouth has a slightly broader grin. Changing them between "takes" makes the puppets break into a laugh in a natural way

Examples of the striking change possible in the facial expression of a single character are demonstrated by the two photographs at the right, one showing slyness, the other triumph



A puppet in the making. From this clay model, fashioned by hand, a cast is obtained which is used to mold the puppet's head. The body, arms, and legs are made so they are soft and flexible





## Electric Pad for Sinus

TO RELIEVE his sinus trouble, a Minneapolis business man designed his own heating pad and hired an electrical engineer to make it. The aid proved so successful that it has now been placed on the market. Moist heat is provided by a cellulose sponge in the washable cover, and the user "dials" an adjustable thermostat for the temperature wanted.



The pad in use. Heat is regulated by means of a dial



## Bit Curbs Thumb-Sucking

CLIPPED to a child's teeth by a pair of gold crowns, the device shown above is said to end the harmful habit of thumb-sucking. Two gold wires block the thumb, but a gold bead strung on one of them may be slid back and forth with the tongue as a substitute for sucking the thumb.

## Tiny Trailer Makes Novel Dog House

WHEN Poochy, pet dog of Mr. and Mrs. J. F. Cannon of Chesaning, Mich., goes trailer-camping with his owners, he enjoys streamline accommodations of his own. In the picture at right, you see him getting into what his master calls "the world's smallest trailer." Emblazoned with the name of its camera-shy occupant, the novel dog house is a miniature counterpart of the vehicle in which it rides between overnight stops.



Poochy hits the hay. On trips, his house is carried inside the real trailer



# Speedy Motor-Cycle Car Runs on Two Wheels

The strange car in motion. To stop, the driver lowers supporting side wheels



**W**HETHER it's a car or a motor cycle would be hard to say, but the inventor of the novel vehicle above declares it has the advantages of both. In motion, it rides upon two wheels, guided by a steering wheel. The driver experiences a pleasant swaying sensation as the machine tips like a plane or mo-

tor cycle for the turns. When the driver stops, a pedal lowers a pair of small auxiliary wheels at the sides for support. The photograph shows the odd gas buggy being driven by a mechanic in a tryout run at Miami, Fla. Another model has a seat for a passenger mounted behind that of the driver.

## Accurate Model of World's Fair Carved in Soap

**A**FTER four months of spare-time work, Ralph Fiordelise, Philadelphia radio-cabinet maker, has just completed a model of the New York World's Fair grounds in soap. The miniature buildings are wired for lights, and even painted. A kitchen knife was the only tool used in fashioning more than 500 pieces of soap that went into the three-foot-square model. Its accuracy may be judged by comparison with the panorama above it in the illustration.



Ralph Fiordelise at work on his soap model of the New York World's Fair



# Water Screen Protects New Fire Boat

PRIDE of the smoke eaters who man the floating fire engines guarding the harbor of New York City is the *Fire Fighter*, a \$1,000,000 ship that embodies all the latest fire-fighting features and refinements, including a piping system around the deck that provides a heavy screen of water to protect the hull against fire. The powerful 134-foot fire boat is equipped with twin sixteen-cylinder Diesel engines that drive her through the water at nineteen miles an hour. Twenty thousand gallons of water a minute can be directed onto a fire from monitor nozzles on the ship and a motor-operated, collapsible tower rises to a height of fifty-five feet, to allow firemen to pour 3,000 gallons of water a minute on the upper decks of ocean liners or to hurl it still higher, to the top floors of giant water-front piers, when necessary.

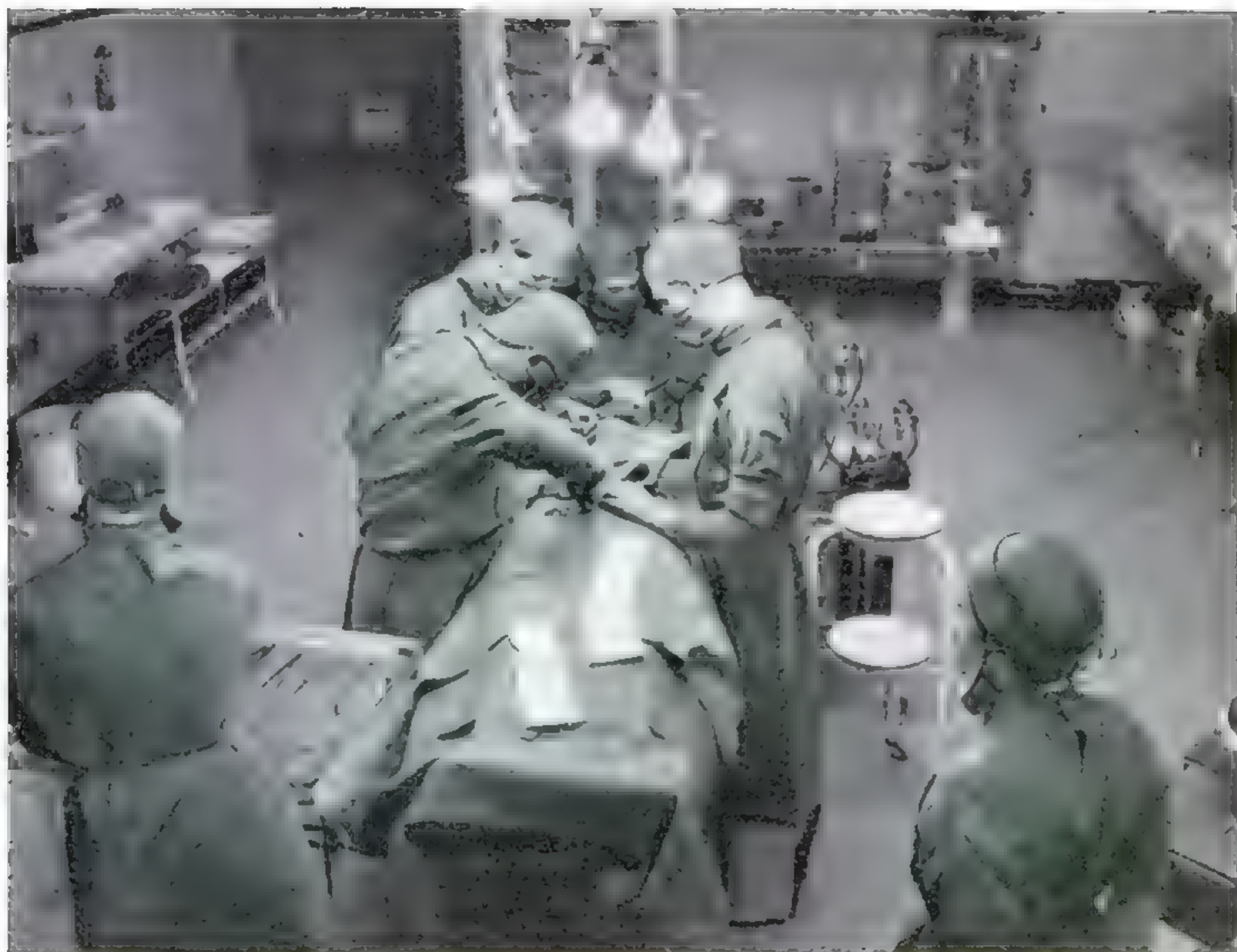


The "Fire Fighter," New York's newest floating fire engine. Note the screen of water that guards the hull against fire

One of the specially trained crew polishing up the nozzles that direct streams of water for fighting fires in steamers and waterfront buildings







## English Surgeons Are "Men in Green"

GOWNS worn by surgeons, assistants, anesthetists, and nurses while performing operations in St. Thomas's Hospital, London, are green in color instead of the conventional white almost universally used in other hospitals both in the United States and in Eng-

land. The unusual shade was adopted because surgeons felt that the color was more restful to their eyes under the brilliant glare of lights in the operating room. The photograph above is the first ever taken of a major operation at St. Thomas's Hospital.

## Sugar Gives Sweet Hair-Do

A SUGAR-COATED hair-do is a new type of beauty treatment now being given to film stars. Sydney Guilaroff, hair specialist for a major film studio, is shown in the photograph at the right, setting curls in the coiffure of Ina Claire, stage and screen actress, with a solution of plain water and sugar.

## Vest-Pocket Telephones

A TELEPHONE that can be carried about and used anywhere without connecting wires is a possibility in the near future. Research on the project has been carried on for several years by the Southern California Telephone Company and, according to latest reports, is now nearing practical application.



Ina Claire, actress, having curls set with sugar

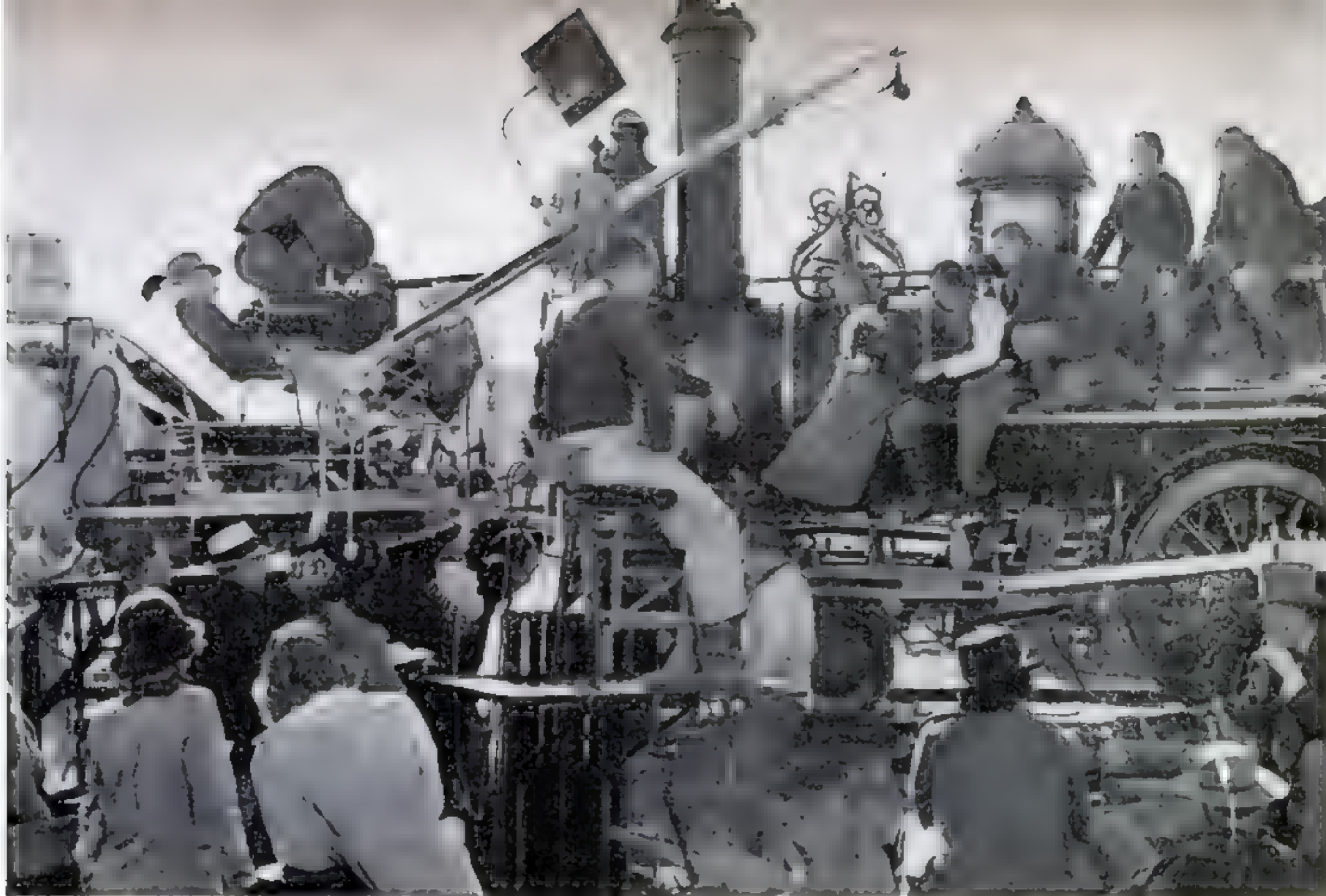


# Big Cake Is World's Fair Model

**B**ILL BAKER, California baker, worked six hours a day for an entire year to design, model, and bake the mammoth cake now on display in the Pure Foods Building at the San Francisco World's Fair. Carefully constructed to scale, models of nineteen California missions, set against a realistic background of miniature mountains, surround the base of the huge delicacy, while its top bears a diminutive reproduction of the Golden Gate area, including its two famous bridges, portions of the cities of San Francisco and Oakland, warships lying at anchor in the harbor, and Treasure Island, the man-made site of the fair. All parts are edible, from the sugar-frosting boats, bridges, and skyscrapers, to the mountains and foliage.







Completion of the first transcontinental railroad being reenacted for camera and microphone

## Old Locomotives Chug Again in Movie

OLD locomotives and passenger cars that once hauled pioneers toward the West and new-found gold back East were recently reconditioned for an appearance in the motion picture "Union Pacific." At Iron Springs, Utah, the venerable engines chugged toward each other to reenact the scene of seventy years ago when a golden spike was driven to complete the first transcontinental railroad.



Seventy-five years old, this veteran still can haul a train twenty-five miles an hour



# Amazing

## BRING FAME

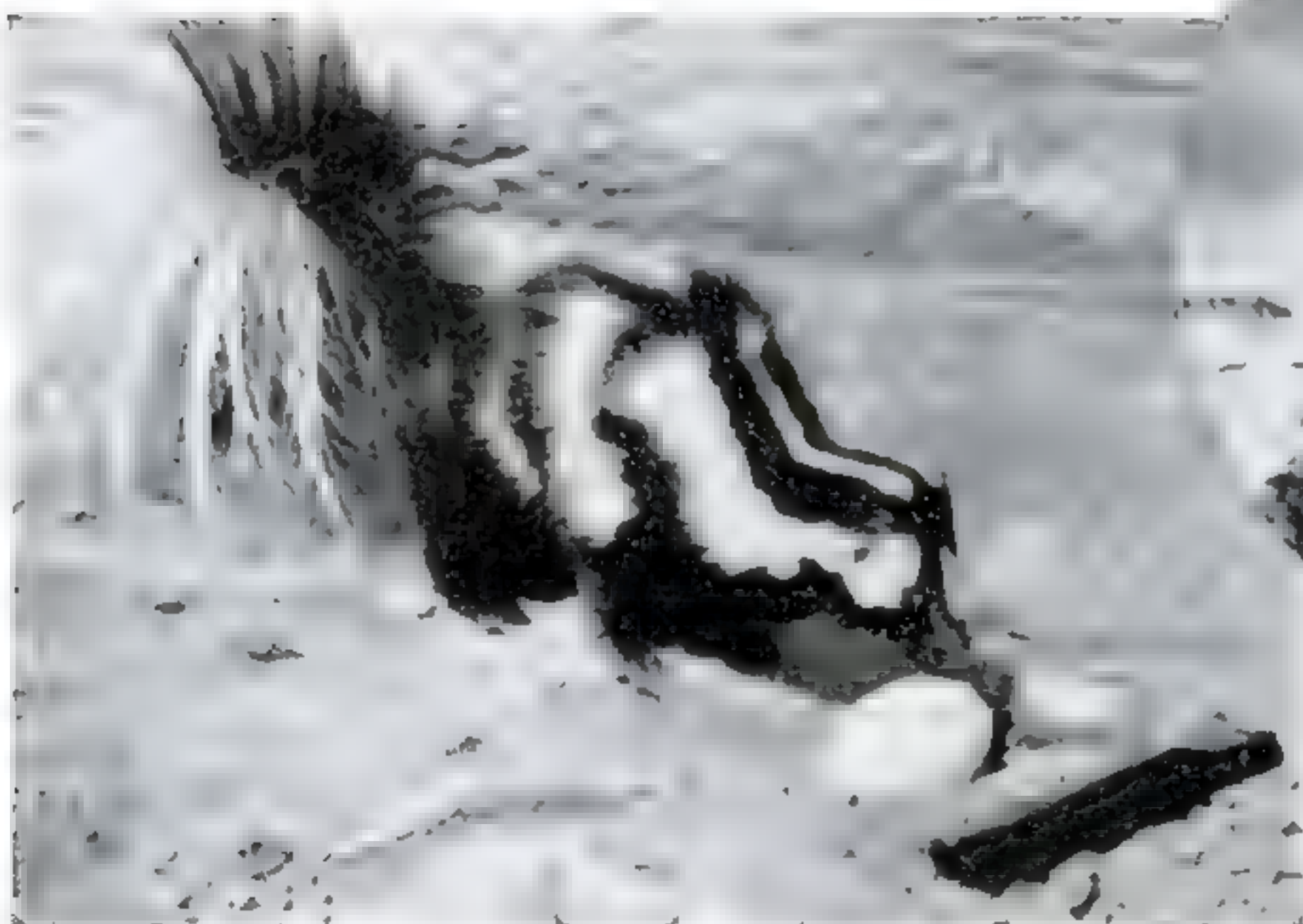


**I**N A desert shack that cost less than fifty cents to build, Fred V. Sampson, of Barstow, Calif., has found not only contentment but a curious road to fame. Three years ago, he left his job as a commercial artist in Los Angeles and built the low, one-room hut on the edge of the Mohave Desert. Three walls are made of mud and stones, the fourth is formed of the gold-bearing rock of a steep hillside. Here, Sampson spends his days doing what he wants most to do, making friends with curious creatures of the desert and snapping pictures of the animals in action. These photographs—some of the most remarkable wildlife pictures ever made—are attracting wide attention.

Chipmunks, deer mice, pack rats, chuckwalla lizards,

Fred V. Sampson with his camera focused on the center of the miniature prize ring to snap a chipmunk bout

PHOTOS © by F. V. SAMPSON



One of the desert photographer's subjects. At left, a skunk is inspecting a hen's egg, which he later broke by tossing it like a ball against a rock



# Snapshots of Animals

## TO DESERT PHOTOGRAPHER



A chipmunk battler squared off for a knockout blow, with his opponent backed against the ropes

skunks, jack rabbits, and other humble creatures of the bleak region come fearlessly to Sampson's door and perform before his camera. Near the shack, "NO HUNTING" signs bear the following words: "The animals near this ridge have been tamed so they may be photographed."

By **ROBERT E. MARTIN**

You are welcome to use your camera but kindly do not use guns or otherwise cause the animals to fear you." The only time Sampson uses a gun himself is to shoot hawks, wildcats, and rattlesnakes that prey on his desert friends. So tame have some of the rabbits and chipmunks







become that he can fire directly over them without frightening them away.

At sunrise, every morning, Sampson is out sprinkling grain and other food about the shack to attract the animals. Of all the creatures that come within range of his camera, the little striped chipmunks are his most lively subjects. They have provided the action for some of his most striking pictures.

When he noticed that they often stood up on their hind legs and pushed and cuffed each other in scuffles over the scattered grain, Sampson built a miniature boxing arena in which they could perform. After he has placed grain inside the ropes, he focuses his camera on the center of the ring and waits for the fight to begin. Soon, two of the "squatties," as he calls the desert rodents, begin squabbling over the food. They rear up, slap, spar, feint, while Sampson follows their movements on the ground glass of his reflex camera. Using split-second ex-

The remarkable picture on the opposite page shows a right uppercut to the jaw. At right, the camera caught two scrapping chipmunks in mid-air. Below, a jack rabbit is encouraged by the tiny rodents to investigate a melon

PHOTOS © by F. V. SAMPSON





posures, he records the various stages of the battle.

Some days, he will shoot half a dozen pictures in as many minutes; other days, he will sit for hours and not get a snapshot. But when this nature photographer trips the shutter he often records pictures such as have never been taken before. Sometimes, the result is a surprise even to him. Once, for example, he snapped the shutter just as two long-eared jack rabbits faced each other across a bunch of carrots. When he developed the negative, he discovered that two chipmunks he had not seen had moved into the scene below the rabbits and were squared off for a battle. Some of the little rodents have become so friendly that they will wag their tails like dogs when Sampson approaches.

While he is taking his pictures, the desert photographer is careful to make no quick movements. He warns his subjects when he plans to change his position and they seem to understand the inflections of his voice. Sometimes, he has to trick timid creatures into assuming the poses he wants. For example, when he discovered that three deer mice were visit-

ing his shack late at night, he sprinkled grain on a narrow ledge over the stove and focused his camera on the spot. About midnight, when the three rodents were in single file on a ledge, he set off a flash and got the picture.

Two of Sampson's oddest visitors are a pair of skunks. They have become so much at home in the shack that sometimes he has to put them out because their scuffling under the bed keeps him awake! One midnight, he was awakened by a noise among the rafters overhead. Peering upward, he saw two gleaming eyes in the dark. With his rifle aimed between the glowing eyeballs, he pulled the trigger and a dead wildcat fell to the floor. Another time, he awoke suddenly to find a skunk combing his hair with its forepaws.

To learn how a skunk sucks an egg, Sampson recently gave one of the animals a hen's egg and, with camera ready, waited to see what would happen. The animal bent down, grasped the egg in its forepaws and, just as a football center passes the pigskin to the quarterback, tossed it back against a rock and smashed the shell. Then, it calmly licked up the white and yolk like a cat lapping up cream!



Sampson in front of the one-room shack in which he lives on the desert. It cost only fifty cents to build



# Horse Neighs O. K. to Tray-Farm Hay



"Bill," New York stage horse, has his dinner on a tray. Right, apparatus in which the grass is grown

**T**RAY agriculture—the ultramodern scheme of intensive hothouse farming with the aid of chemical plant food—has just received an enthusiastic O.K. from one of New York City's leading animal stars of the stage. "Bill," the white horse that performs at the Radio City Music Hall, is shown in one of the illustrations enjoying a meal of oats grown in

six days by the new method. Within a tall humidor, the grass grows on trays that are automatically sprinkled with a chemical mixture. Inserted at the bottom of the ovenlike apparatus, a tray is moved upward one shelf each day, until at the end of the six-day period it holds a full-grown patch of oat grass for Bill's dinner.



Perforations in a player roll cause lights to flash in translucent piano keys

## Light Flashes in Piano Keys Guide Fingers

**T**O MAKE it easy to learn to play the piano, lamps flash through the translucent surface of the keys in an instrument of new design. Actuated by perforations in a player roll, the "prompting" lights show the student just where to place his fingers to sound the proper notes for the selection of music he is studying. An electric control governs the speed of the roll, which may be run slowly at first, and increased in speed as the learner becomes more proficient.





Testing one of the 100 mobile gas detectors to be used in Paris, France

## Cycle Fleet To Warn Paris of Gas Raids

EQUIPPED with poison-gas detectors of new design, masked Paul Reveres on a fleet of 100 motor cycles will dash through the streets of Paris, France, in case of air raids. Turning a hand crank draws air into a chemical sampler and through a telltale liquid, which turns from blue to yellow in the presence of toxic war gases. After warning the populace, the squad will "mop up" affected areas with decontaminating apparatus.

## Canoeing Classes Held in Swimming Pool

BY GOING canoeing in a swimming pool, at a New York Y.W.C.A., novices are learning to handle their craft safely. Experts teach them how to launch a canoe, dive from one without upsetting it, and save themselves if it capsizes. Even when overturned, the instructors point out, a canoe has plenty of buoyancy to keep you afloat; ignorance causes most canoe accidents.



Launching a canoe in a New York City swimming pool. The canoeists at the left are practicing the kneeling paddling position



# "Health Bank" Stores Serum

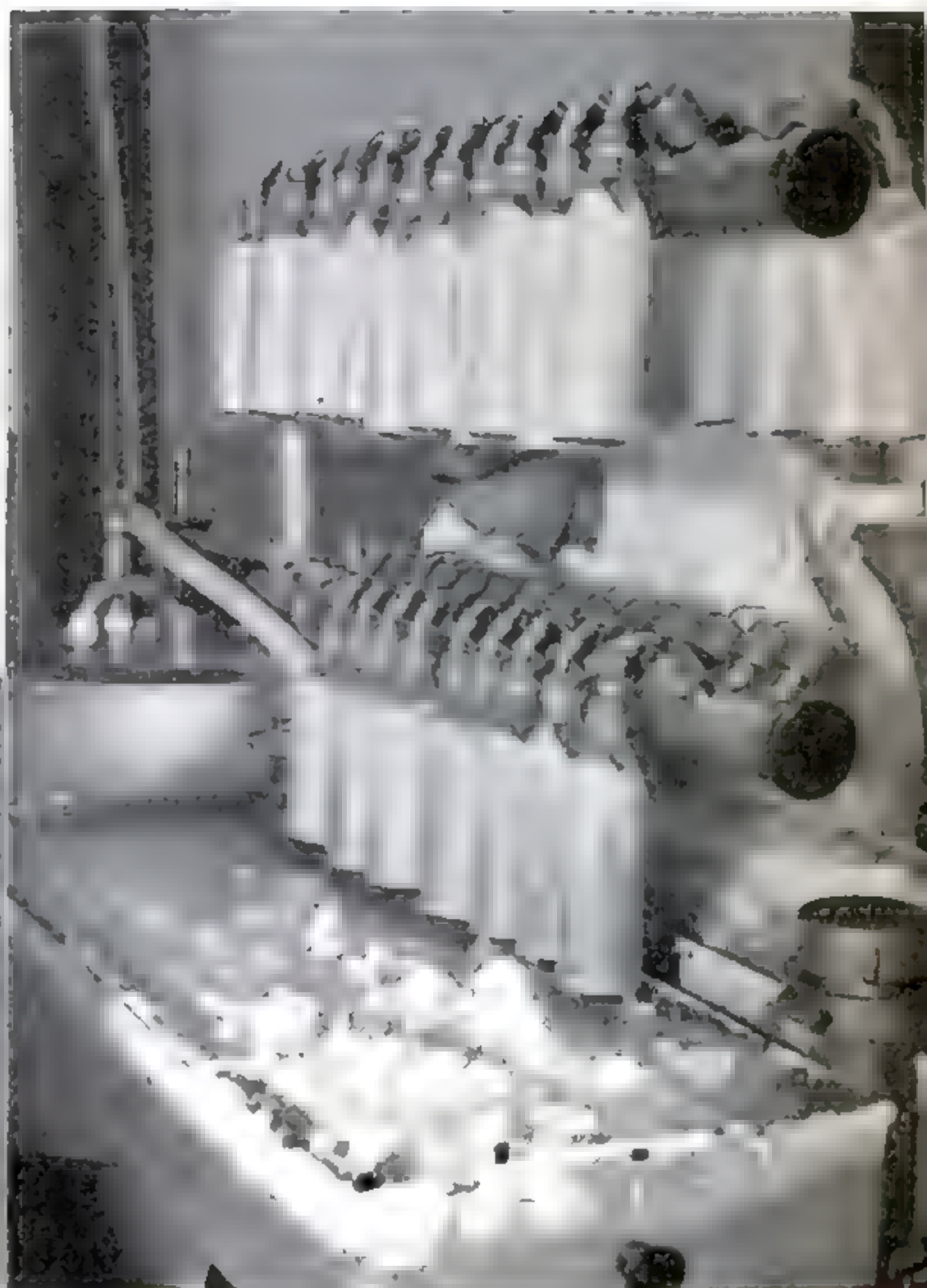
**B**LOOD is the commodity deposited in and withdrawn from a novel serum bank set up in the Children's Hospital, Hollywood, Calif. The bank's depositors, who receive ten dollars for each half-pint deposit, are persons who have recovered from such diseases as scarlet fever, measles, mumps, whooping cough, and infantile paralysis. Their blood, which has developed an immunity to one or more of these diseases, is prepared for future withdrawal for use in the treatment and prevention of these illnesses in others. The blood is treated by a special apparatus that freezes and then dehydrates it, to prevent coagulation, or clotting. It is then stored until needed in a refrigeration vault.



Changed into a serum, the blood is labeled and placed in a room kept at thirty-four degrees F.

Immune to scarlet fever because she has had the disease, the "depositor" in a California hospital's "serum bank" is donating her blood to immunize others

JUNE, 1939



Blood supplied by donors immune to various contagious diseases is frozen and dehydrated in this apparatus to prepare it for storage in the "bank"





# Operating Cage Protects Lion Doctor

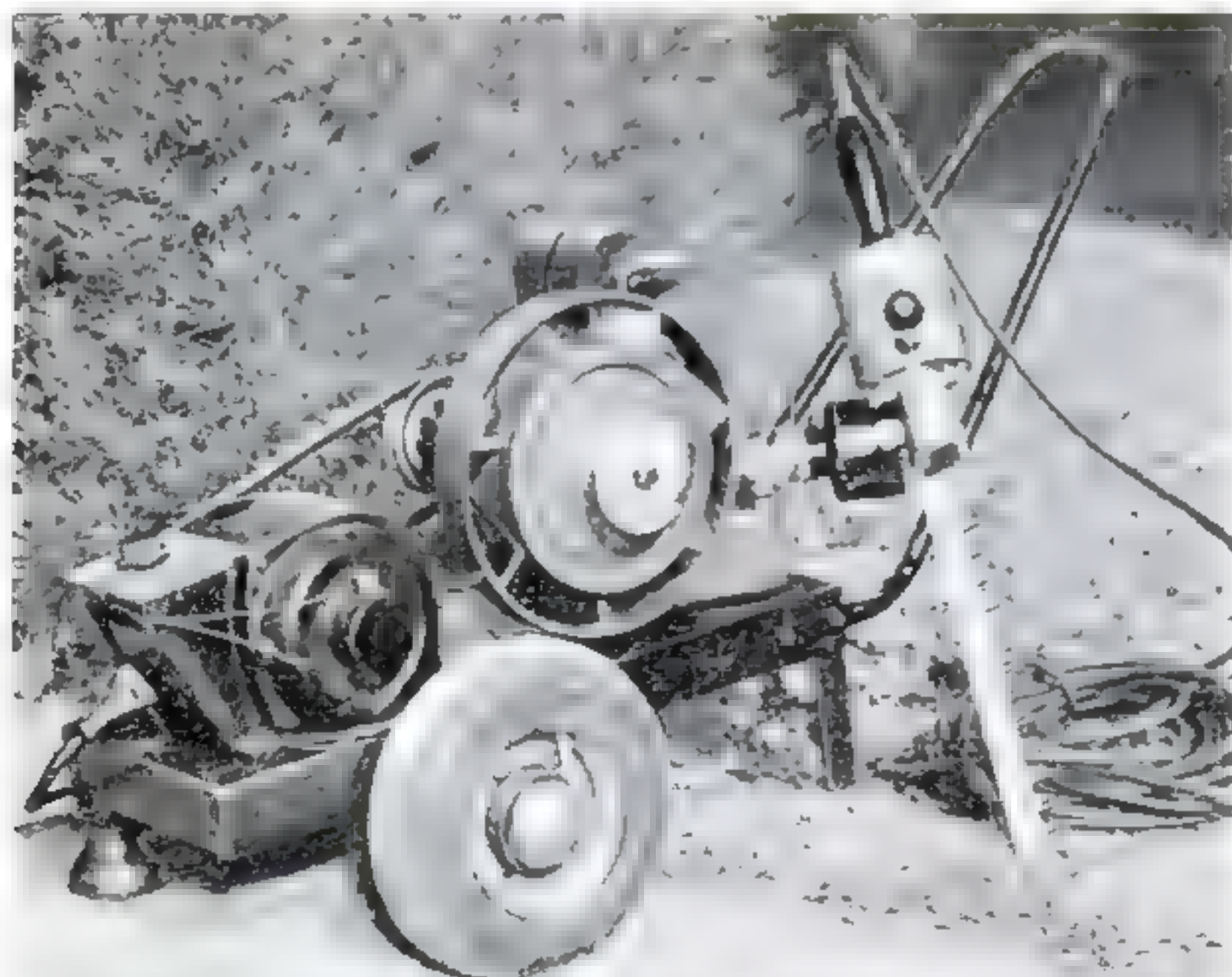


Leo submits to a veterinary's care, held gently but firmly by the cage walls

A UNIQUE "operating cage" protects a veterinarian from injury when he treats the ills of 200 lions at an El Monte, Calif., farm. When a lion has been lured into the cage with meat, an end gate closes behind it. Assistants then operate ratchet levers that move one of the side walls inward, pinioning the dangerous beast against the opposite wall. For treating foot injuries, four trapdoors enable any of the lion's paws to be snared with nooses of heavy silk cord and drawn through the bottom of the cage.

## Portable Clipper for Hedges Has Gasoline-Electric Drive

GASOLINE-ELECTRIC power furnishes hair cuts for hedges in Miami, Fla., where the park employees have to barber miles of borders of waist-high Australian pine. To give the feathery tips the frequent grooming that they need, the pneumatic-tired truck shown below may be wheeled to any spot. A small gasoline motor runs a generator, and waterproof cables carry the current to an electric clipping tool, which stands on end at the right of the picture.



The hedge trimmer set up for use. A gasoline motor powers it



## Odd Egg Resembles Electric Bulb

TO BACK his claim that one of his hens had laid an egg shaped like an electric-light bulb, a Russellville, Ky., farmer forwarded the evidence to the Rural Electrification Administration office at Washington, D. C. The freak egg and a standard household bulb, compared in the picture above, seem to prove his point.

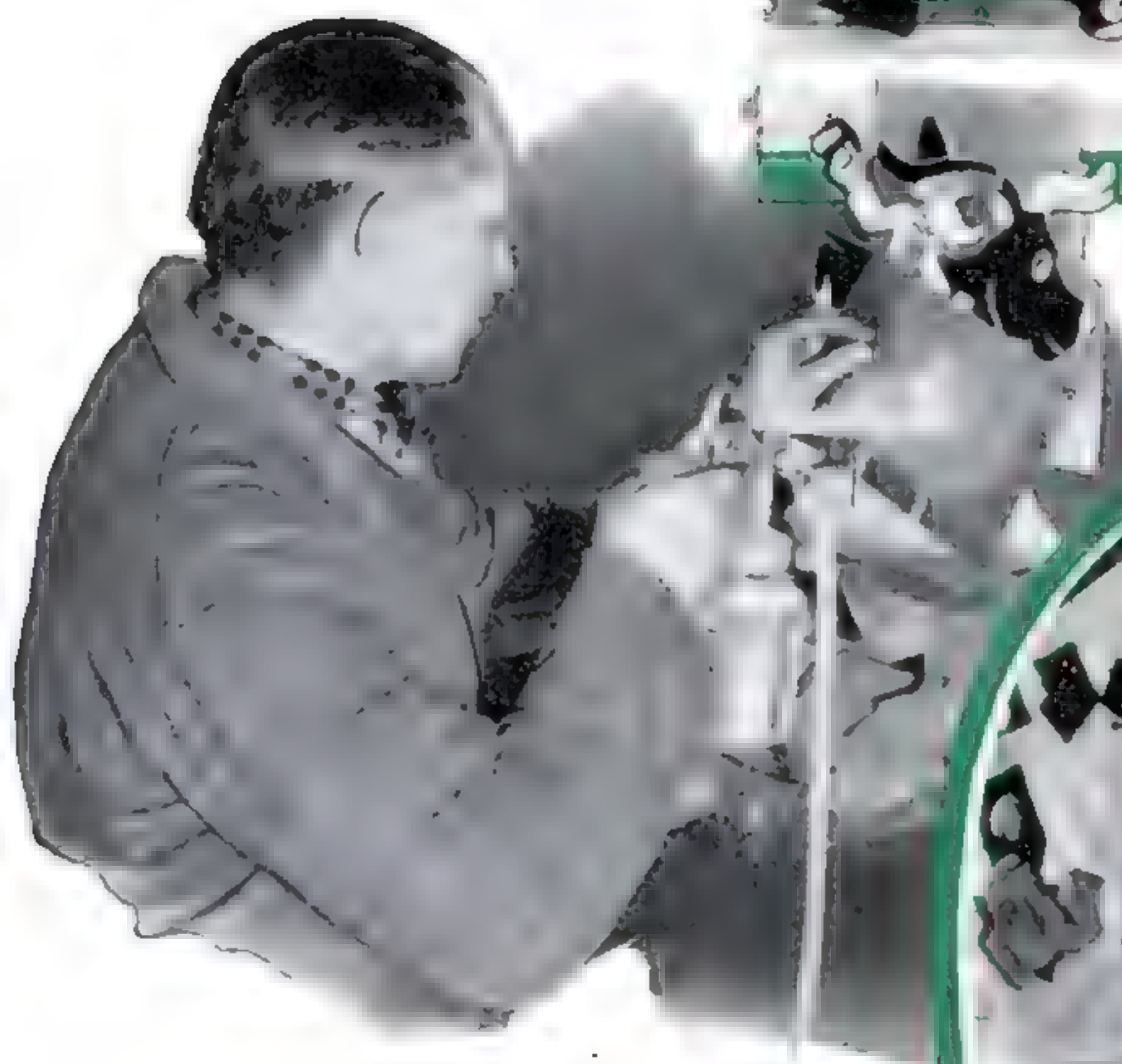


# Wealth from Toys

## SAVES BACKWOODS VILLAGE



Making displays like this skater and skier has brought prosperity to a New England village left without an industry when its only mill shut down



**B**Y TURNING toy maker, Seaverns Hilton, poster designer, of New York and Boston, has saved a picturesque New England village from ruin and restored it to prosperity. Forgotten among the heights of Mount Blue and Tumble-Down Mountain, since a retreating timber line closed the spool mill that was its last industry, the town of Weld, Maine, had dwindled from 4,000 to 437 inhabitants when Hilton visited it one summer. Many of those left were skilled craftsmen, cut off from their only means of livelihood. So Hilton invested his savings in a power tool, borrowed money enough to buy another, and set up a workshop where they could profitably exercise their talents with jig saw and paint



Seaverns Hilton selecting stencils for coloring products of his craftsmen proteges. At left, spraying on the paint

brush. His venture has proved successful, and trucks rumble once more over long-abandoned roads, bearing his products of pure American folk art—wooden figures of native characters and animals.







# Dare-Devils of the Forest

By JOHN E. LODGE

**A**T A lumbering site in the State of Washington, Pete Peterson, veteran high-climber, snapped his climbing rope onto his heavy safety belt, dug his spurs into the trunk of a giant evergreen, and started a 170-foot scramble skyward. His job was to lop off the trunk's tip so the big tree could be used as an improvised derrick for swinging heavy logs out of the forest. Halfway through the ticklish task, a gust of wind hit the tree. Without warning, the top splintered off. As terrified comrades, watching from below, saw the trunk sway like a mammoth catapult Peterson drove his ax into a crack in the splitting stub to wedge open a narrow space, into

which he dug his fingers and held on grimly for his life until the trembling tree came to rest.

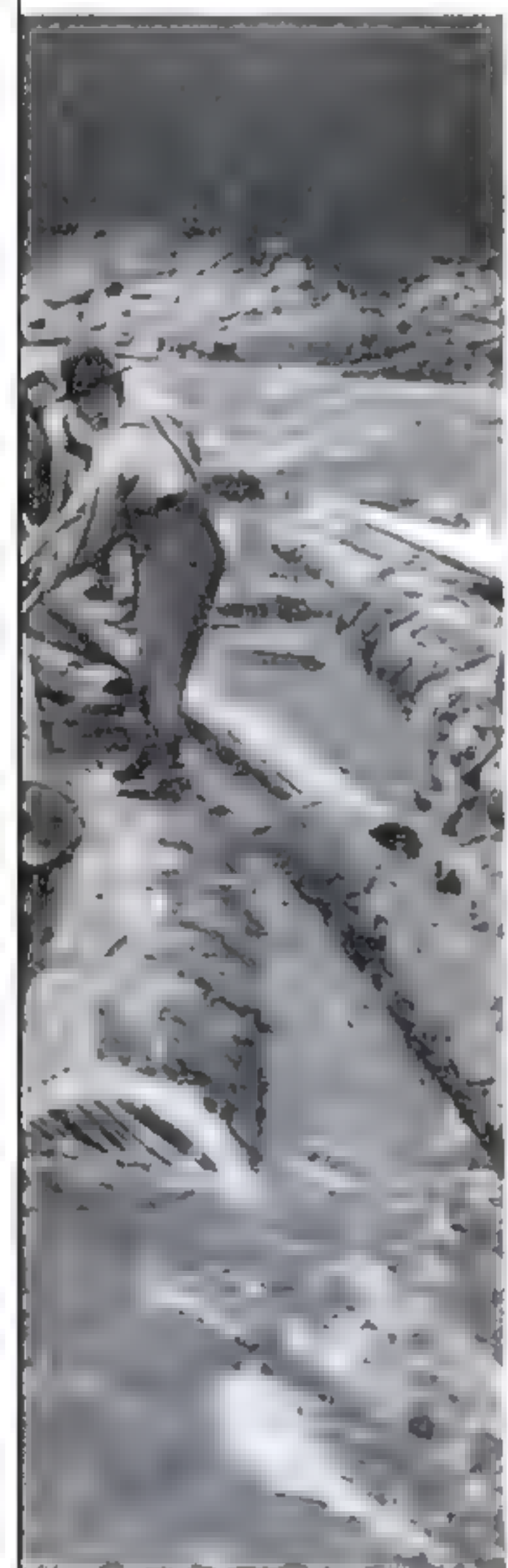
This is typical of the breath-taking hazards that face the high-climber, the dare-devil of the lumber camp, when he makes his dizzy climbs to prune the branches and tops from trees. With a long handsaw and a heavy ax dangling from his belt, the climber flips his rope loop upward and hauls himself after it in a series of perpendicular hops. Descending, experienced "toppers" never climb down, but rather leap earthward in twenty-foot steps, checking their descent momentarily with rope and spurs.

Veteran high-climbers know only two rules: Go up only in calm weather, and never, no matter what happens, come down until the job is finished. They are their own bosses; nobody can make them go up against their wishes.



Dragging his ax and saw, a high-climber starts up

jobs that require skill and  
ve—topping a tree and herd-  
logs downstream to the mill

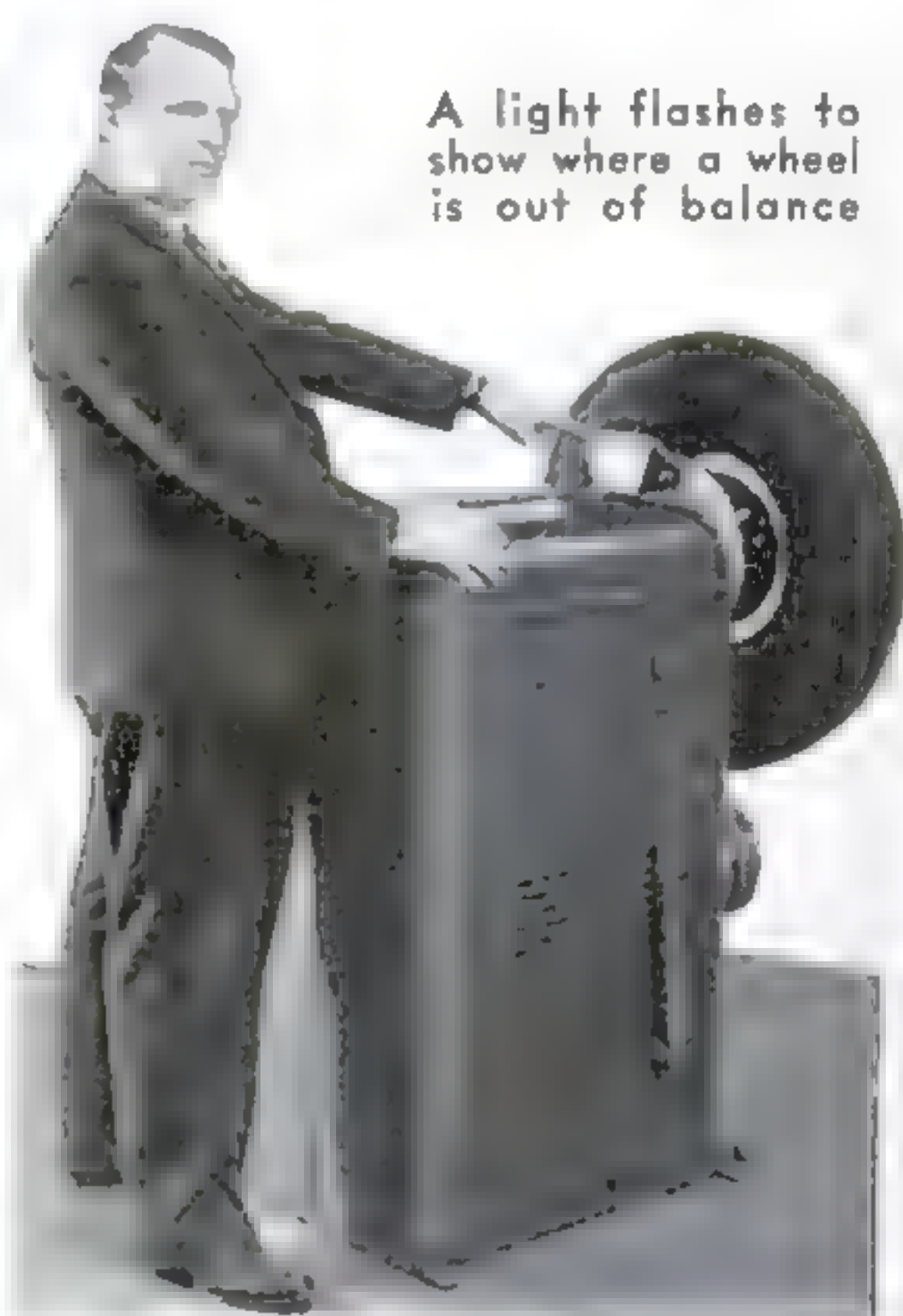






## Machine Tests Auto Wheels for Balance

AUTOMOBILE wheels are quickly and accurately tested for balance with the electrically operated machine shown in the illustration below. When the wheel to be checked is mounted on the device and whirled at speeds ranging from twenty-five to eighty-five miles an hour, a neon light flashes on to indicate just which section of the wheel is out of true balance. Appropriate weights can then be attached, and the wheel retested until it balances perfectly.



A light flashes to show where a wheel is out of balance

## New Artificial-Fever Machine

SAID to have tremendous advantages over any previous form of treatment, a new type of fever machine developed by two University of Pennsylvania scientists produces artificial body temperatures in patients suffering from rheumatic heart disease, meningitis, and other illnesses.

## Electric Nail File Is Beauty-Shop Aid

NAILS are manicured by electricity with a new motorized nail file recently introduced in England for beauty-shop use. Driven by a small electric motor, a tiny emery wheel mounted on the end of a flexible shaft shapes finger nails quickly and smoothly. The wheel is fitted with a safety guard to protect the fingers of both the operator and the customer while the electric nail file is in use, as shown in the photograph reproduced at the right.



The tiny sander is mounted on a motor-driven flexible shaft

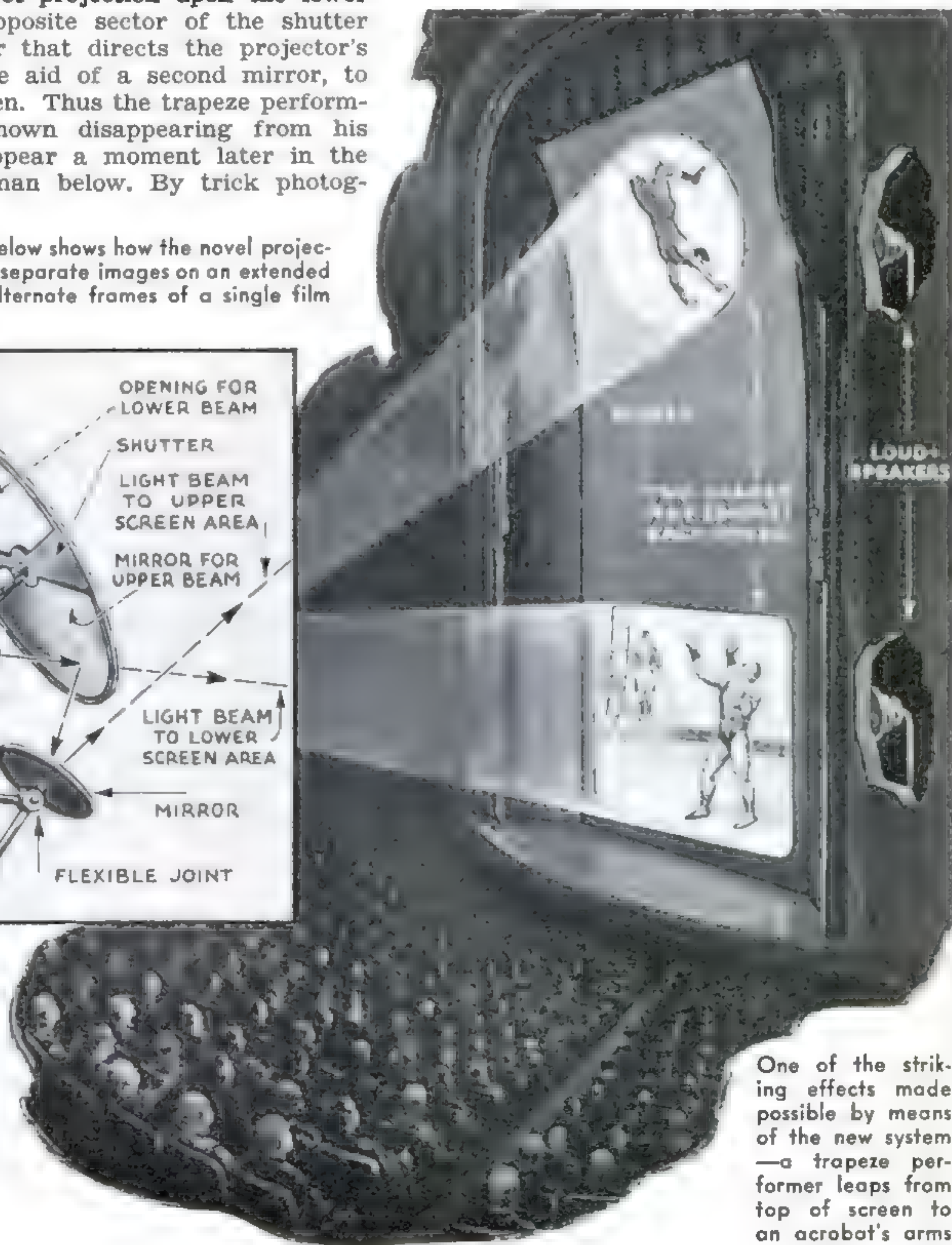
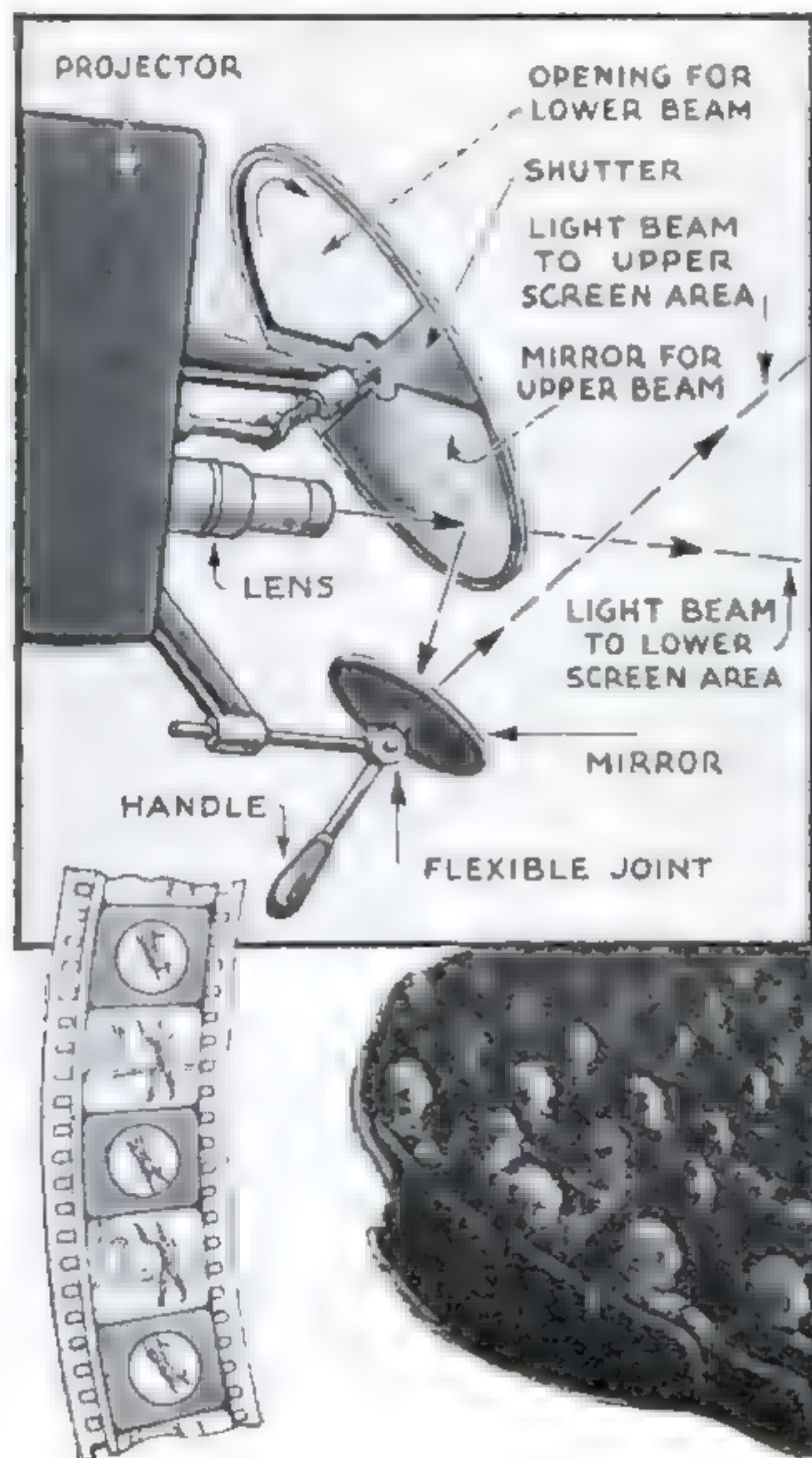


# Double Movie Gives Odd Effects

**S**PECTACULAR movie effects are made possible in a dual projection system devised by a California inventor. For example, a trapeze performer may be shown apparently leaping from the top of a theater into the arms of a fellow acrobat at stage level. In the new system, the standard screen is supplemented by another that forms a vertical extension. Movies are simultaneously projected upon the main and auxiliary screens, from alternating frames of a single film passing through the projector. The latter employs a special rotating shutter, with an open sector for direct projection upon the lower screen. The opposite sector of the shutter holds a mirror that directs the projector's beam, with the aid of a second mirror, to the upper screen. Thus the trapeze performer may be shown disappearing from his swing, to reappear a moment later in the arms of the man below. By trick photog-

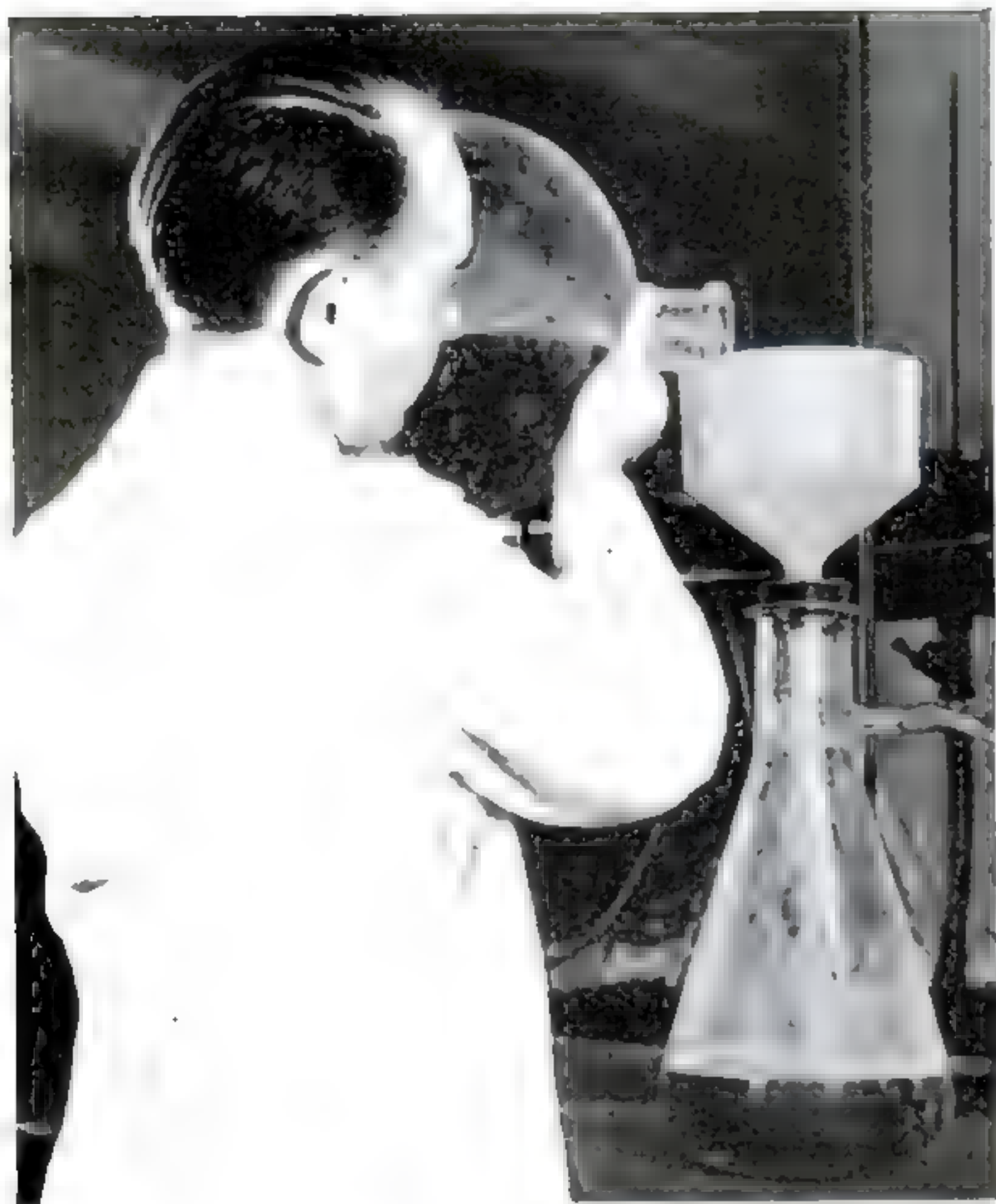
raphy and an arrangement permitting the second mirror to be turned with a handle, like a spotlight, the inventor maintains it is also possible to "follow" the simulated leap all the way down. Both "straight" and "trick" effects can be applied equally well to scenes including airplanes, high buildings, or other elevated points where part of the action takes place. Loudspeakers behind upper and lower screens make corresponding sound effects come from the right directions, thus heightening the realism of the pictures.

The drawing below shows how the novel projector throws two separate images on an extended screen from alternate frames of a single film



One of the striking effects made possible by means of the new system—a trapeze performer leaps from top of screen to an acrobat's arms





A laboratory worker cleaning a tub of human hair received from a barber shop. After treatment with hydrochloric acid, impurities are filtered out, as at left



## Rare Chemicals Made from Human Hair

WHAT becomes of the hair that finds its way to barber-shop floors? Some of it, at least, now goes into the manufacture of rare "amino acids," the chemical compounds that might be considered a sort of missing link between non-living and living matter. Representing the nearest approach of chemists to creating the proteins of which animal cells are made, these synthetic substances have

been made by modern alchemists from such odd materials as goose feathers, squash seeds, and fish entrails (P. S. M., June, '36, p. 14). Now human hair has been found a new source. When it has been cleaned and treated with hydrochloric acid, the precious extract is filtered off and the acids are isolated and purified, ending up in bottles available to experimenters at prices up to \$1,000 a pound.



Synthetic flowers in plastic pots. At the far right is a woman's heel of a cast resin

## Heels and Flowerpots Go Plastic

FLOWERPOTS, and heels for women's shoes, have now joined the growing list of uses for synthetic plastics. An ingenious "honeycomb" construction of the heel, illustrated at right, makes it possible to nail it to the shoe with existing machinery. Unlike a wooden heel, the plastic kind will not split. It also offers the advantage that a new lift may instantly be snapped into place when the old one wears down. The new plastic flowerpots, shown in the photograph at the left, are declared well suited for growing real plants—though in the illustration it just happens that they are holding artificial flowers, which are made out of synthetic plastics too!





# Turbine Steels Get Rigid Tests

TO TEST steel designed for use in the construction of giant steam turbines, to determine the amount of expansion and contraction that will take place in the metal during the life of the generating units, General Electric research engineers are subjecting sample rods to ten years' confinement in electric furnaces where constant temperatures of 1,200 degrees F. are maintained. Instruments used to measure changes in the heated test samples show expansions as minute as one millionth of an inch for each inch of a rod's length. In another test, rods are subjected to the pull of lead weights exerting a force of 60,000 pounds to the square inch, in addition to extreme heat.



In this electric furnace, heated steel rods are given a pull of 60,000 pounds to a square inch

Below, research engineers examining one of the rods before placing it in the testing furnace



One end of a large "heat-test" furnace, showing the ends of the sample rods and the gauges used to measure the expansion and contraction of the turbine steel





# College Students Taught To Fish



Dr. Francois D'Eliscu, professor of fishing at Columbia University, in his study. At right, he turns a racket into a net

GONE are the days when a student had to play hooky from school to get in an afternoon's fishing. Columbia University in New York City has added a course in angling to its regular curriculum. Under the guidance of Dr. Francois D'Eliscu, an ardent angler, the subject is treated in all its phases, from selecting baits and lures to mounting or cooking the catch. In the photographs on this page, Columbia's professor of fishing is shown in his study, where he spends his spare time thinking up new ways to lure fish. Above, he is seen working on a homemade minnow container knocked together from two old tin cans and parts of the stem of a discarded umbrella. At the right, he demonstrates how a fishing net can be made from a broken tennis or badminton racket,



by using the handle and framework as a basis. Incidentally, Columbia also offers its students a comprehensive course in the fine points of that old classical subject, baseball.





## Airport Perches on City-Hall Roof

THREE HUNDRED feet wide and nearly a quarter of a mile long, an airplane landing field which can be revolved to point into the wind perches atop a thirty-one-story building designed as a city hall, in a unique model recently presented for the consideration of Detroit, Mich., municipal officials. Costing about \$8,000,000, the proposed structure would be erected on a river-bank site easily reached by land and water transportation.

## New-Type Light Bulb Eliminates Glare

GLARE from the glowing filament is practically eliminated in a new type of electric-light bulb now available. A special treatment of the inside of the glass bulb breaks up the harsh, glaring rays so that they are claimed to be perfectly diffused over the entire bulb surface and at the same time transmitted evenly through the glass itself. The new bulb, shown at the right in the adjacent illustration, is now being manufactured in all sizes from fifteen to 300 watts.



Note the uniform glow of the new-style bulb at the right

## Trailer Hitch Built To Fit Any Make Car

SIMPLY and quickly attached to practically any late-model automobile, a universal trailer hitch now on the market requires no drilling, cutting, or welding to install. Made in styles for either straight or rounded rear ends, the drawbar attachment can be adjusted to raise or lower the hitch ball to level the trailer.



U bolts clamp the trailer hitch to the bumper brackets. It can be attached in half an hour





Aerial view of Oak Island. Arrow shows spot where treasure hunters will soon renew the attack on the "money pit"

## NEW CLEWS AID SEARCH FOR

# Oak Island's Gold



This map, drawn from the charts of Captain Kidd, is much like Oak Island both in outline and in small details



**W**HEN compressed-air drills begin biting through blue clay and brown marl on a tiny island off the Nova Scotia coast, a few weeks hence, gold seekers will be returning once more to the long search for the most elusive treasure in the world. One hundred and forty-four years have passed since the shovels of the first searching party cut through the sod of Oak Island. Since then, during half a dozen generations, party after party has come, probed the earth, and left, baffled by the riddle of the island.

These diggers found wooden platforms buried 100 feet in the ground; a beach cove excavated to form a gigantic artificial sponge with tons of tropical fibers buried beneath the sand; a mysterious "money pit" flooded by an endless stream of sea water flowing down a crude underground



# Old Pirate Maps Reveal a Strange Resemblance to the Hiding Place of Captain Kidd's Treasure

By  
**EDWIN TEALE**

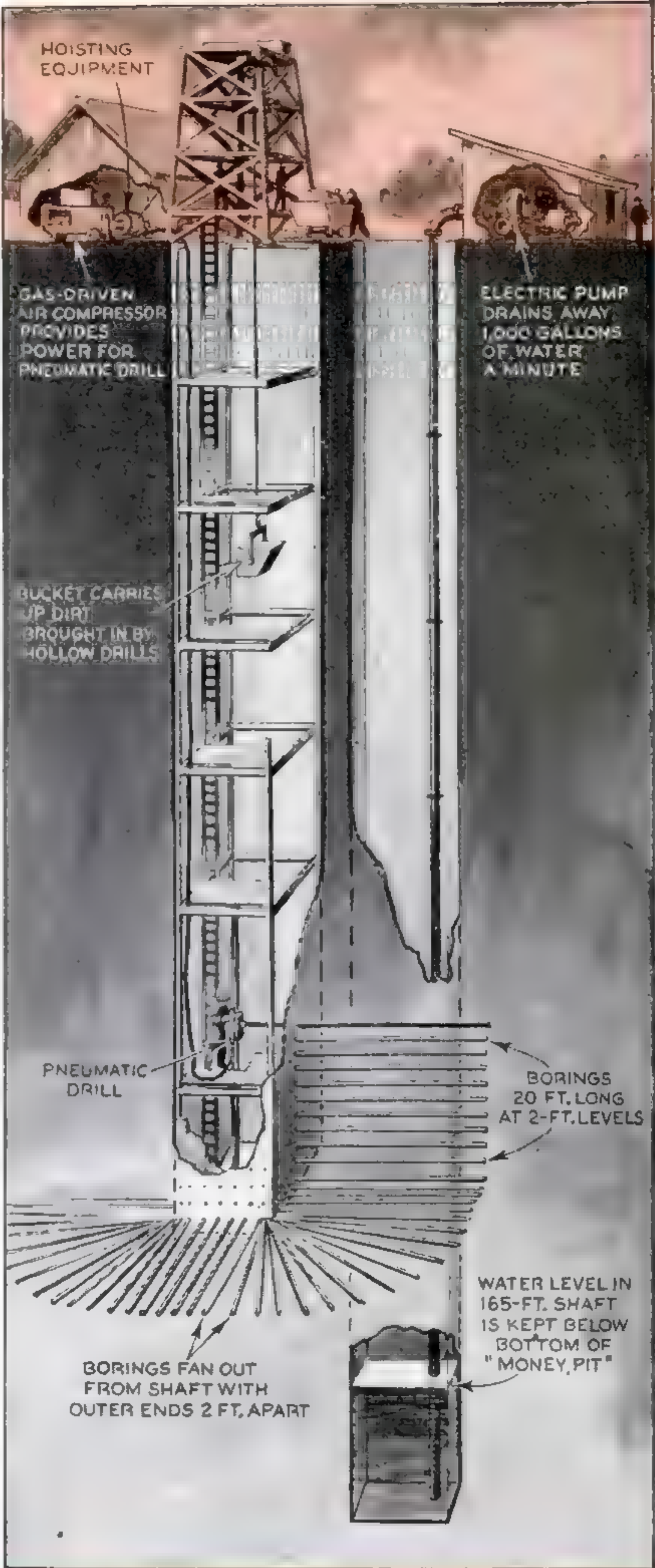
conduit. Plumbing with core drills the depths of this drowned stronghold, they brought to the surface a fragment identified at the Smithsonian Institution as parchment, and material analyzed in England as man-made cement.

Who were the artisans that tunneled far beneath the surface of the island? What mysterious treasure lies in the subterranean, sea-guarded vault? A host of searchers, including among others Franklin D. Roosevelt, have journeyed north in hope of erasing those question marks. As was related in the two previous installments of this series, drills and dynamite, pumps and deep-sea divers, failed to solve the enigma of what lies beneath the curious, elm-like oaks that set this island apart from the more than 350 other dots of land in Mahone Bay.

And now we come to the remarkable story of Gilbert D. Hedden and his 15,000-mile search for clues.

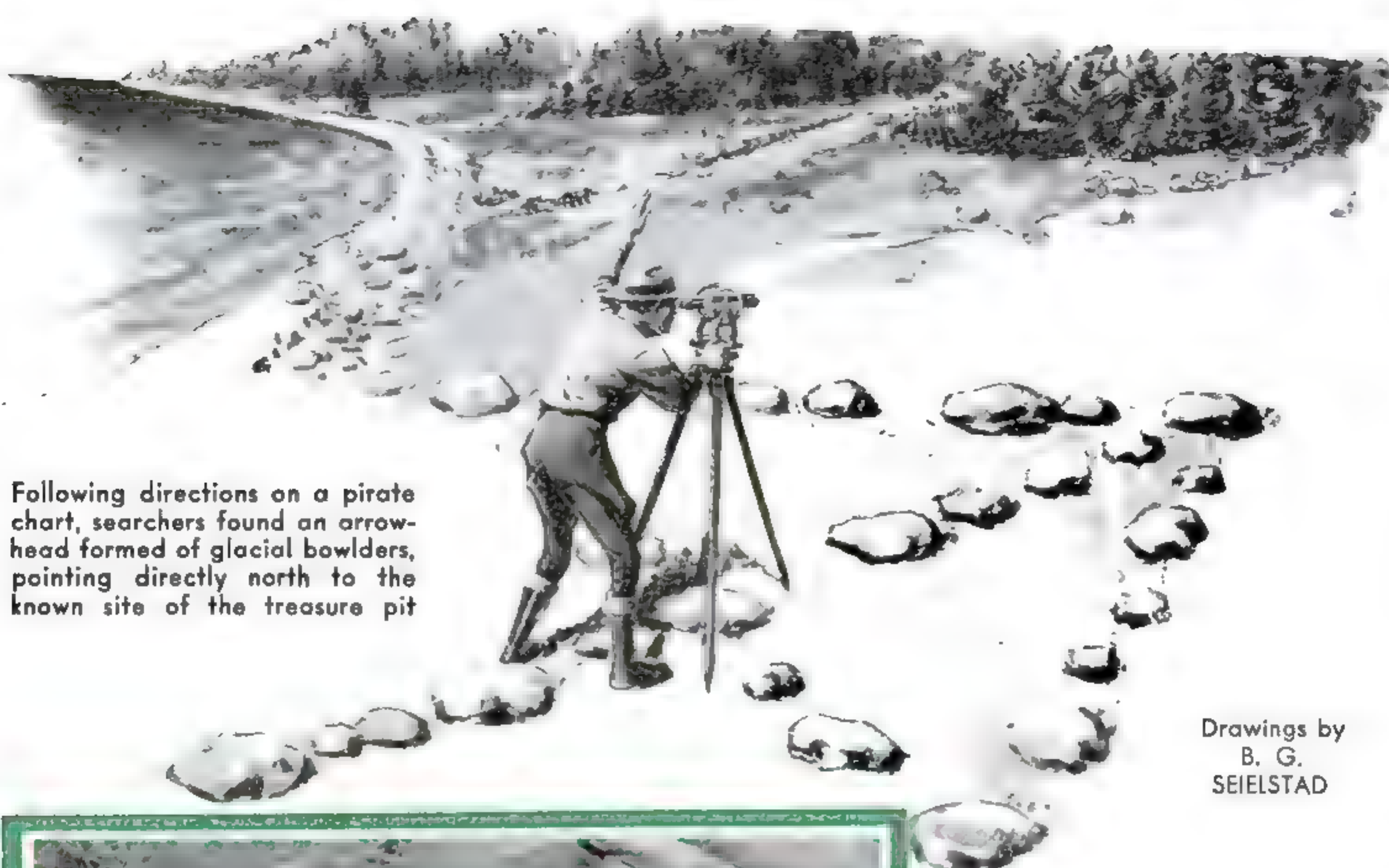
In the spring of 1928, Hedden picked up the magazine section of the Sunday "New York Times" and read an article on Oak Island. At the time, he was head of a steel-fabricating company in New York City and the engineering problems presented by the money pit fascinated him.

He began collecting articles and books on the island mystery. He traveled half a dozen times to Nova Scotia. He had aerial photographs snapped from the sky over Oak Island. He journeyed to England and the Continent, interviewing persons who might provide new clues to the old mystery. He hired a lawyer to check up on the family history of all persons connected with the various treasure companies. The report



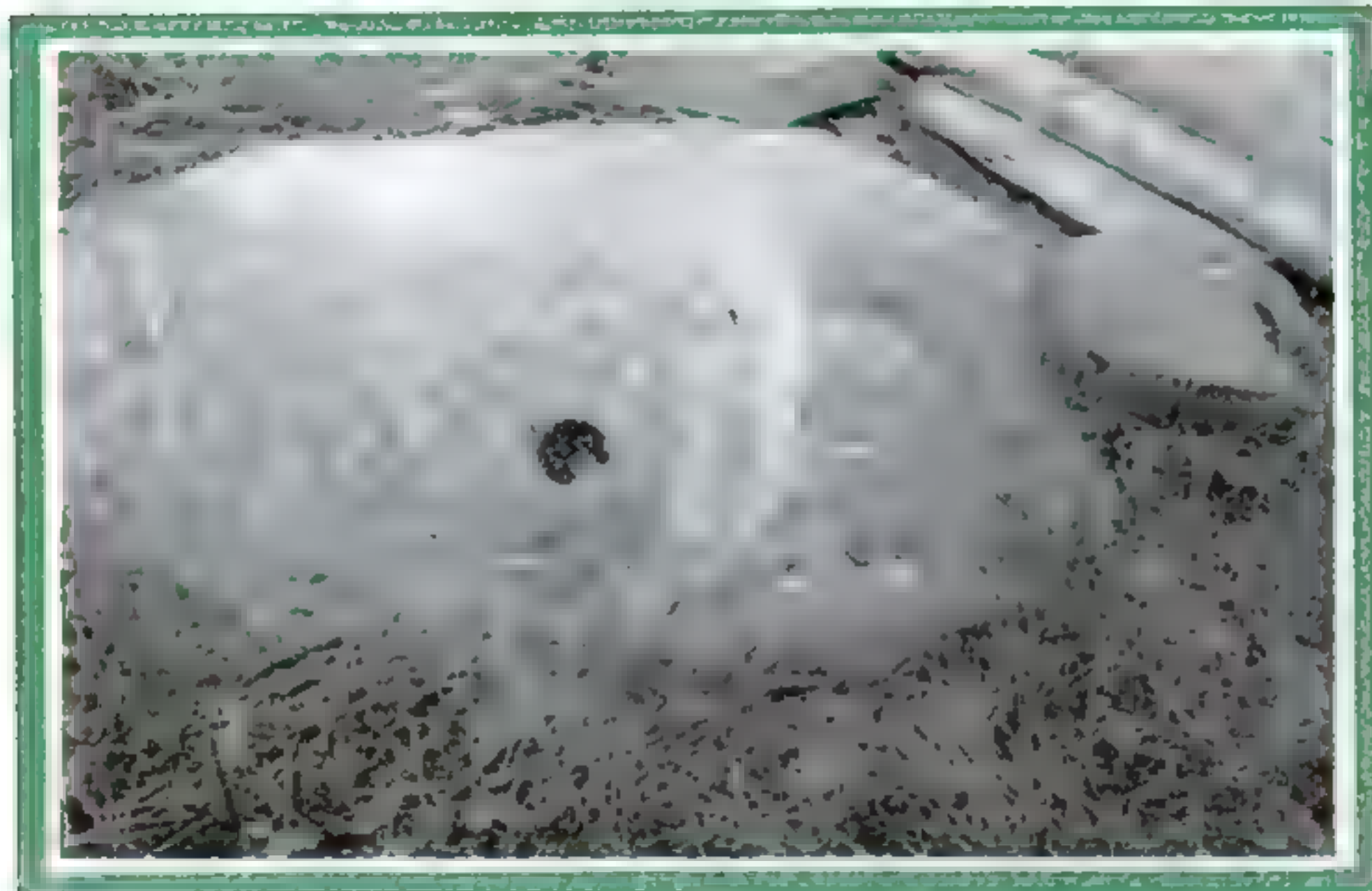
How Gilbert D. Hedden will try to conquer the treasure cache with powerful pumps and pneumatic drills





Following directions on a pirate chart, searchers found an arrow-head formed of glacial boulders, pointing directly north to the known site of the treasure pit

Drawings by  
B. G.  
SEIELSTAD



Holes drilled in stones, like the one above, fit the descriptions of landmarks in an old map supposed to show Kidd's hidden loot

showed that all were honest, trustworthy, highly respected citizens.

Convinced that the story of the island was no hoax, Hedden and a few of his close friends formed a syndicate. They bought the southern end of the island, where the money pit and the mysterious cove beach are located. A contract was signed with Sprague & Henwood, prominent Pennsylvania firm of mining and drilling engineers, to supply the latest machinery and equipment. Electricity, reaching the island from the mainland through submarine cables, will spin high-speed pumps when the operations of the summer begin. Before we take up plans for the coming season in detail, however, let us digress for a moment and consider an amaz-

ing discovery of recent months.

In a book written by a European author, who had access to maps known to have been passed down by the notorious pirate, Capt. William Kidd, Hedden came upon a composite chart supposedly representing the "tropical" island where Kidd buried the bulk of his long-sought-for treasure. Immediately, Hedden was struck by the similarity between the Kidd island and Oak Island.

Both were approximately the same shape. Valleys and elevations were in similar positions. On the south side of Oak Island a low, swampy tract appeared where the Kidd map indicated a "lagoon." The spot on the Kidd island where a legend indicated the "boate" had landed, corresponded to the only place on Oak Island where a sloop could anchor close inshore. In all, Hedden found fourteen points of similarity. Chance might account for a few, but so many points of likeness convinced him that he had struck a fresh trail which might lead him to the correct solution of the island riddle.

He began checking back over the tangled records of Kidd's activities. When the pirate returned from the West Indies, before his arrest, he was known to have been in the re-



gion of New England for some time. Hedden believes it is entirely possible that he sailed north to the maze of islands in Mahone Bay, long a haunt of pirate craft, and there secreted most of his loot. The history and legends of the Nova Scotia coast strengthen his belief.

About 1763, for instance, according to the famous "History of the County of Lunenburg" by Judge Mather des Brisay, a man died in what was then called "the British Colony of New England." On his deathbed, he confessed that he had sailed with Kidd and had helped that notorious pirate bury great treasure on a little island somewhere "east of Boston." It is interesting to note that the coasts to the northeast of Boston are generally called "down east" by New Englanders.

Again, there is a record of a mysterious stranger who appeared in one of the coast towns not far from Mahone Bay in the early years of the nineteenth century. He purchased a small sailing craft and hired a native of the town to sail it according to his directions. Day after day, he would head out to sea, reach a certain point and then sail in along the same compass bearing. When Hedden laid out a straight line on the map, from the spot where these trips commenced to Oak Island, he found the line missed all of the other hundreds of islands in the bay. Only from this one direction, could a ship come straight in from the sea to the mystery island.

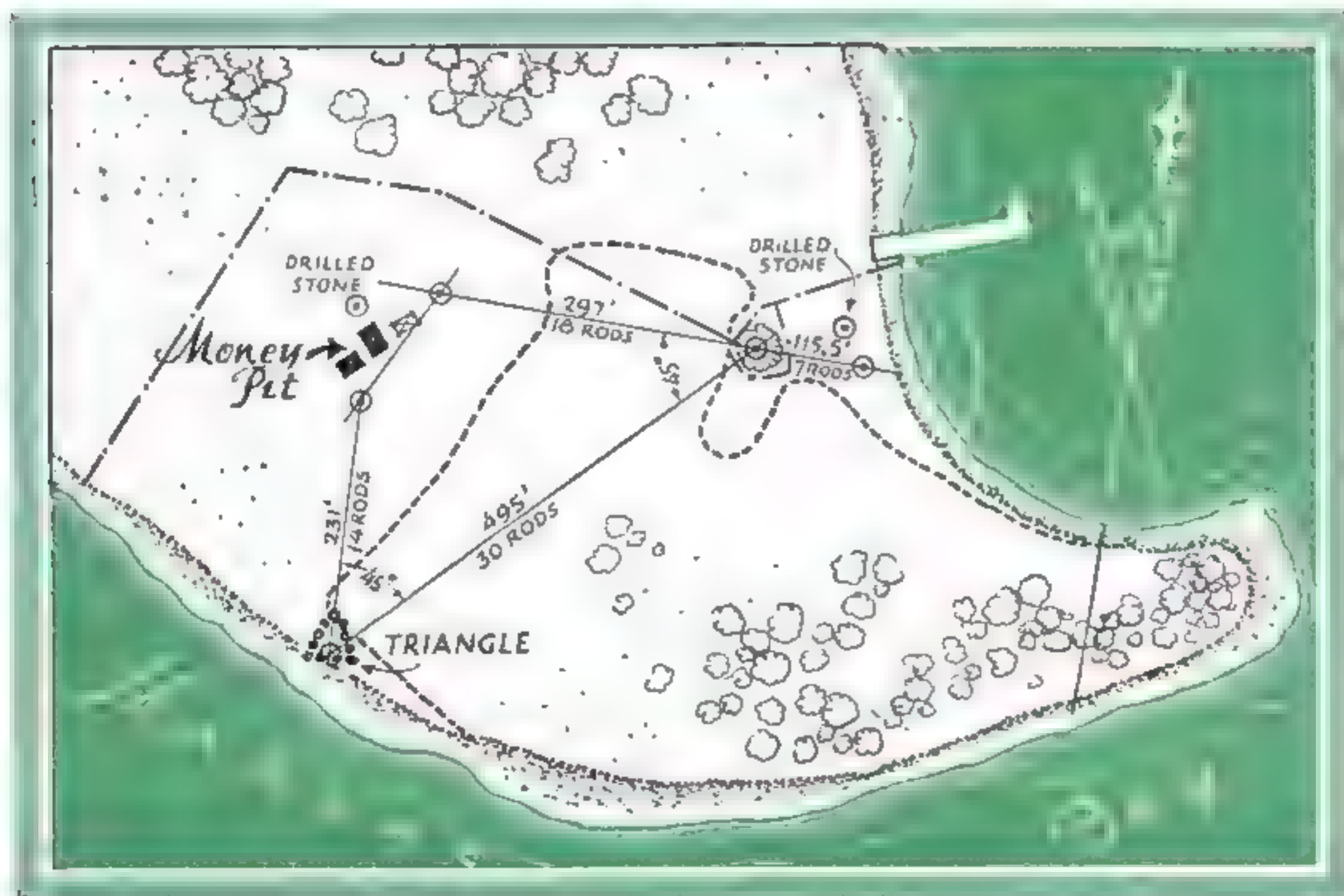
In the Bodleian Library, at Oxford University, England, letters written by Kidd himself are still in existence. One of these promised the government official to whom it was addressed to reveal the hiding place of the pirate's treasure if his death sentence

would be commuted to life imprisonment. Nothing was done about the plea, and when Kidd was hanged in London on May 23, 1701, he left behind him a treasure mystery unsolved to this day.

The possibility that this mystery and the riddle of Oak Island are one and the same, is spurring on the efforts of Hedden and his associates.

Last summer, with the assistance of a surveyor from Halifax, N. S., Hedden discovered an astonishing additional link between the Kidd map and Oak Island. At the bottom of the published chart, there appeared the legend: "18 W and/by 7 E on Rock, 30 SW, 14 N Tree." What that meant nobody knew. Then, one day last August, Hedden noticed a curious hole in a gray granite boulder. The hole was perfectly round, two inches deep and an inch and a quarter in diameter. Frederick L. Blair, who has been associated longest with the island, recalled he had seen a similar hole in another rock somewhere near the center of the island. After considerable hunting, it was located. The hole was exactly the same depth and diameter. Who drilled it, when and why, are still mysteries.

But when Hedden ran a line between the two rocks, he found its direction was due east and west and that the sink hole into which the oxen fell, as was related in the first article of this series, lay directly on the line. More than that, it was almost exactly seven rods from one stone to the hole and eighteen from the other. Hedden recalled the "18 W by 7 E on Rock" legend on the chart. He hired a surveyor from Halifax to lay off the lines accurately. Then, from the sink hole, he had the surveyor run a line thirty rods southwest, as indicated on the chart. Before this could *(Continued on page 226)*

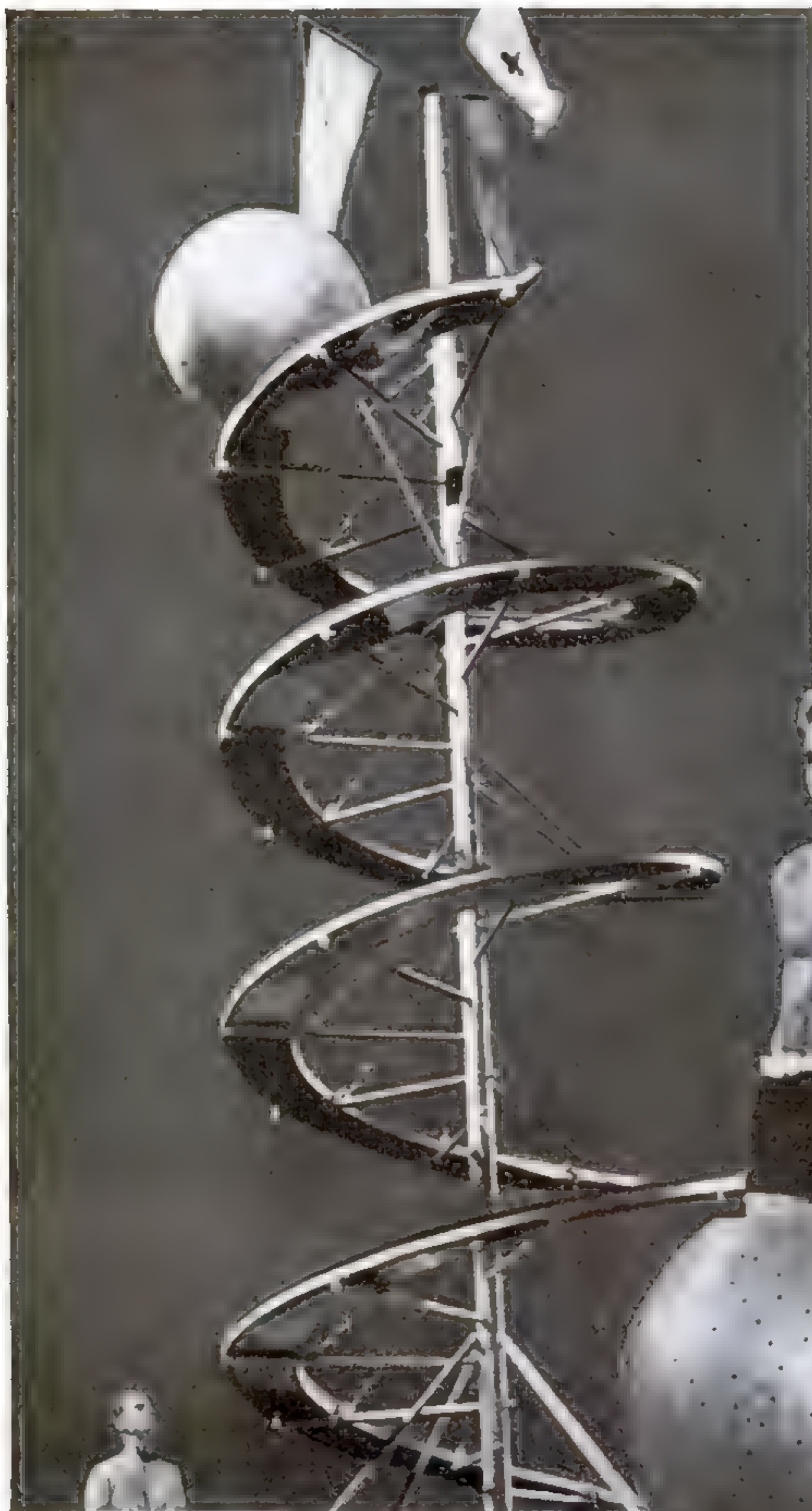


#### NEW DEVELOPMENTS ADD TO MYSTERY

How landmarks on Oak Island agree with those on the pirate map. From a fixed point on a line between the two drilled stones, searchers were led to discover a triangle of stones, which in turn pointed to the money pit. Bearings and distances matched the cryptic directions on the old treasure chart



# Man Rolls Up Incline in a Ball



The ball nearing the end of its climb up the spiral ramp. At right, the performer is seen entering the perforated sphere, which he propels by shifting his weight

ENCASED in a metal ball, a European performer lifts himself "by his own bootstraps" up a high spiral runway and then rolls down to thrill carnival crowds. Hand holds within the hollow sphere enable the skillful contortionist to shift his weight so as to climb the incline, in apparent defiance of the law of gravitation. When he reaches the top, he relaxes his strenuous efforts, and the ball and its human cargo come rolling down with gathering speed in a dizzy finale. Perforations in the globular shell and its "man-hole" cover enable the occupant to breathe.







## Diver Tidies Pool with Vacuum Cleaner

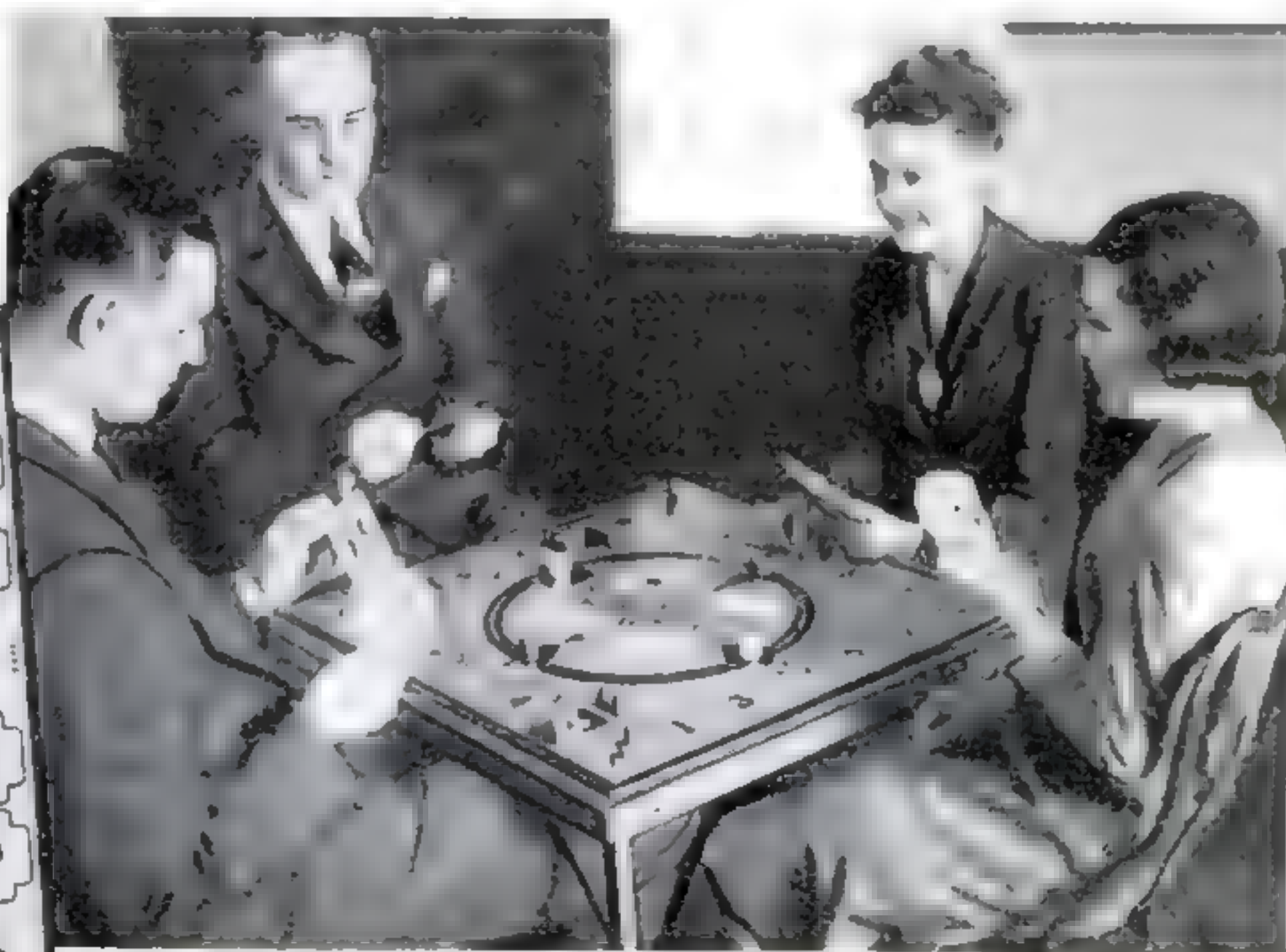
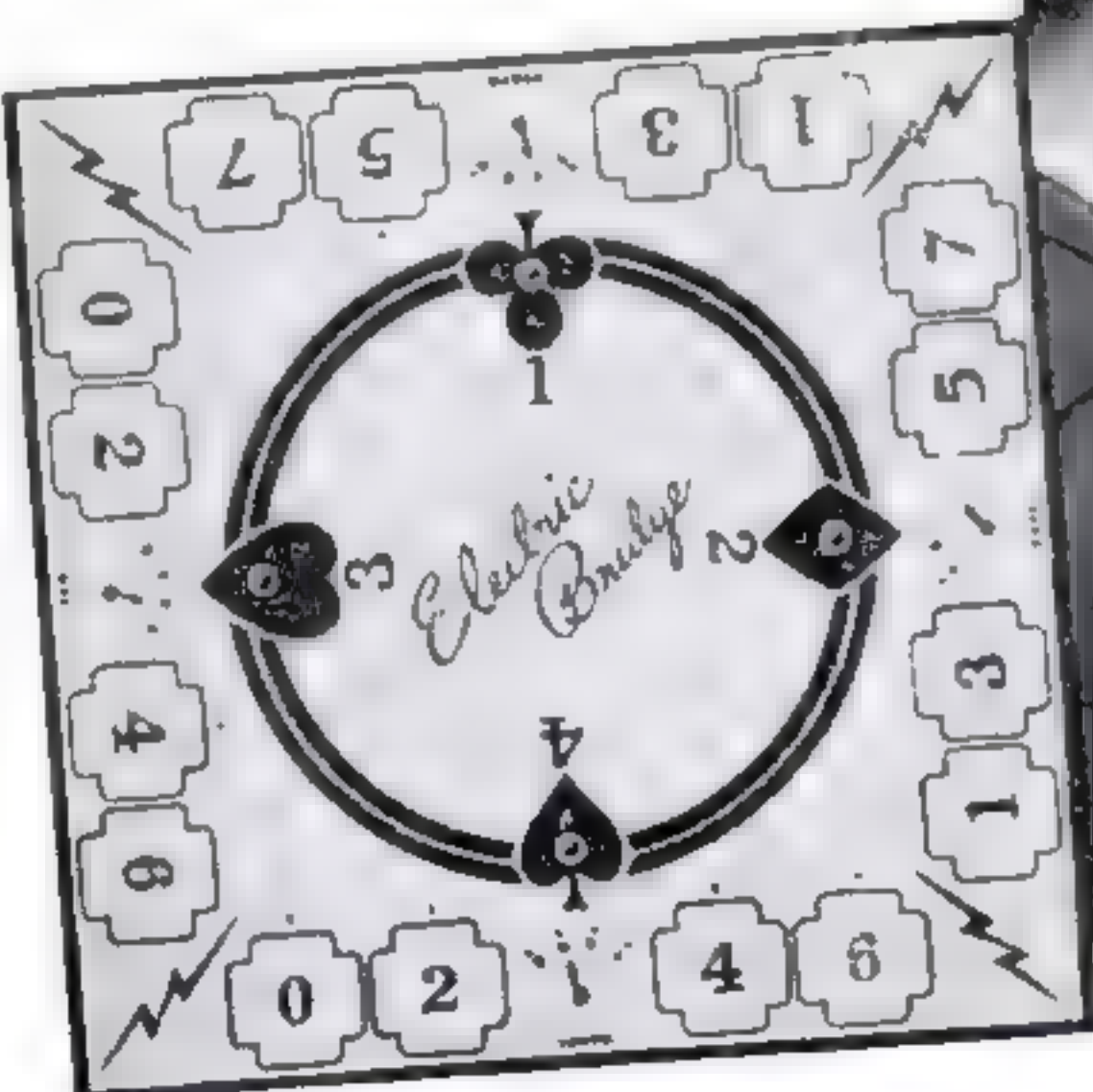
KEEPING a swimming pool tidy by vacuum-cleaning it is the odd method employed at a Long Beach, Calif., tank for bathers. Wearing a diving helmet, a workman periodically goes over the bottom with the business end of an ordinary vacuum cleaner. Through a long hose, a suction machine above the surface draws out dirt and debris. Floats support the trailing hose lines for the diver and his cleaner. The system makes it unnecessary to empty the pool for every cleaning.

Wearing a diving helmet, a workman removes dirt from the floor of the pool

## Electric Board Adds Thrills to Bridge Game

PLAYED upon a special board with flashing lights, "electric bridge" combines the fascination of the standard game with the fun of "pitch" and the strategy of chess. Bidding is for points instead of tricks. Then each player, in turn, sets an individual control lever on one of several electric contacts. Depending on the combination of the settings, four miniature lamps on the board remain unlit, or one or more flash on, to indicate a number from zero to seven. This is the number of points scored by the winner of the first trick, who places it in

a correspondingly numbered space on the board. He now must move his control lever to a different contact, and lead to the next trick. Learning how to "play" the controls for scores favorable to your side and discomfiting to your opponents is declared a thrilling addition of the new electrified bridge to the conventional game.



Playing the new game. Controls set by players flash lights to determine scoring value of tricks. The board is shown at left



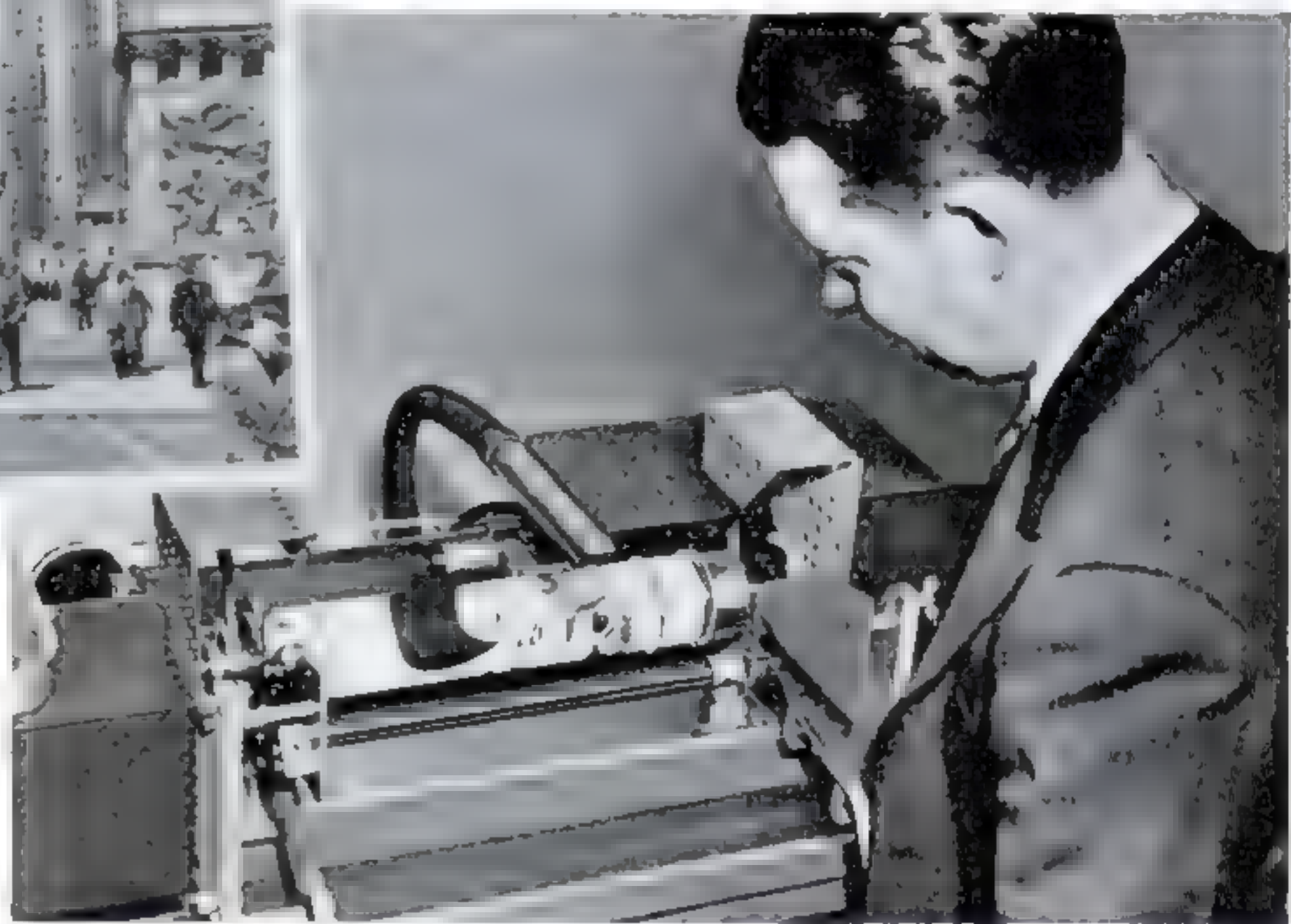
# Pictures by Wire Arrive Ready for Use



The remarkably clear reproduction above was made direct from a picture received by telegraph

Special paper on a revolving drum is sensitive to the current passing through it, darkening to form the image

USING paper that is sensitive to electricity, just as photographic paper is sensitive to light, telegraph engineers recently demonstrated how pictures ready for instant viewing or reproduction without additional processing now can be transmitted by wire. Electric impulses are sent by a transmitter that "scans" the original picture, to a receiving machine having a stylus that contacts the electricity-sensitive paper on a revolving drum. The impulses pass from the stylus through the paper, darkening it to form an image identical with the original picture.



How light from the stage shows up printing on the translucent program

## Novel Program Can Be Read in Dark Theater

WHAT good is a program in a darkened theater during a show? No good, decided an English inventor, so he developed a semitransparent program which theatergoers simply hold up so that light from the stage or moving-picture screen is *behind* it. Outlines of the printed matter on the program thus are silhouetted so that they become readable, regardless of how low the theater lights are turned.

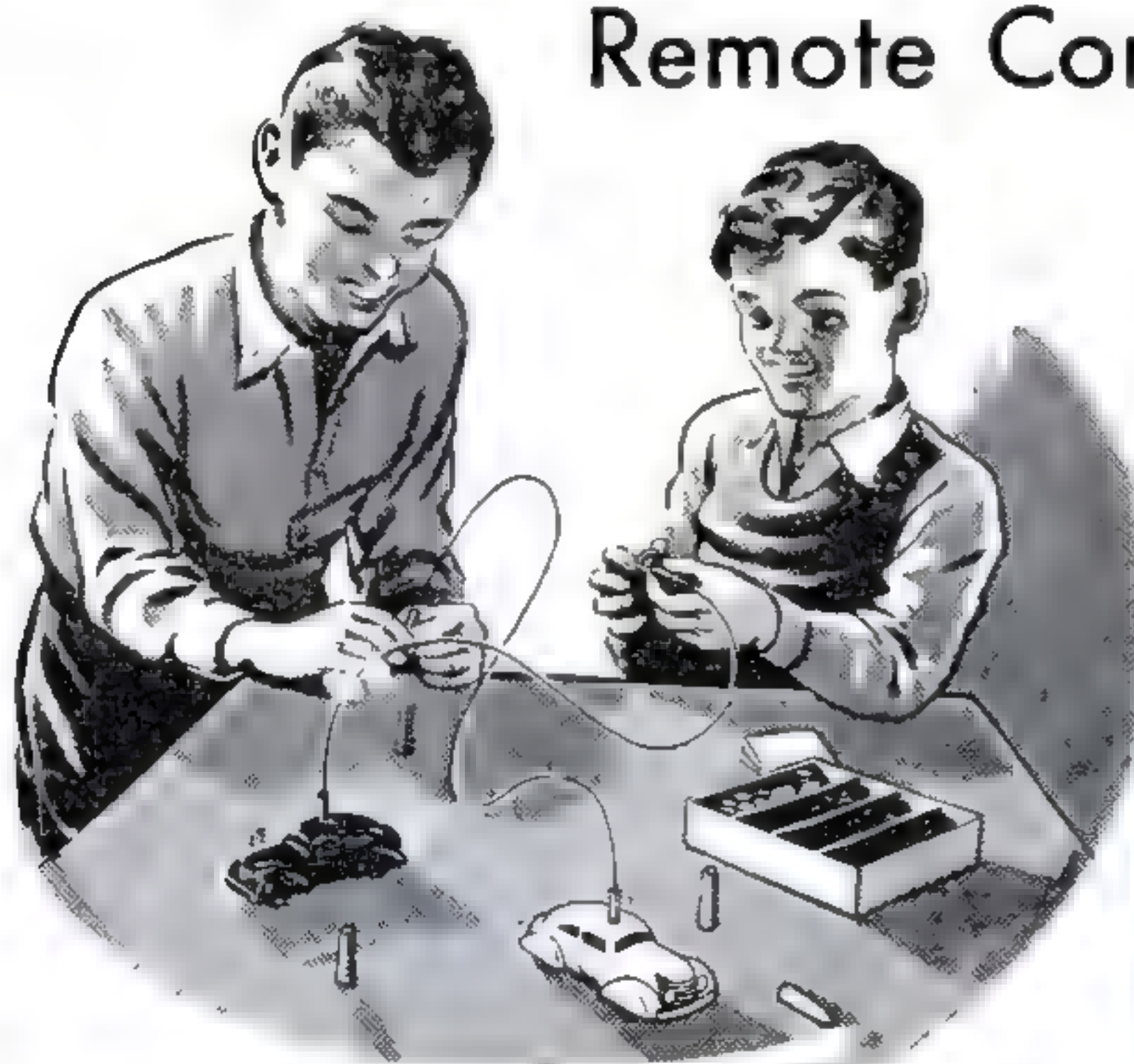




## Folding Board Makes It Easy To Rest

**PERFECT** relaxation is declared possible with an adjustable "posture board" designed by a California inventor. Recently placed on the market, the device is shown above in use by a seashore sun bather. With head back, and

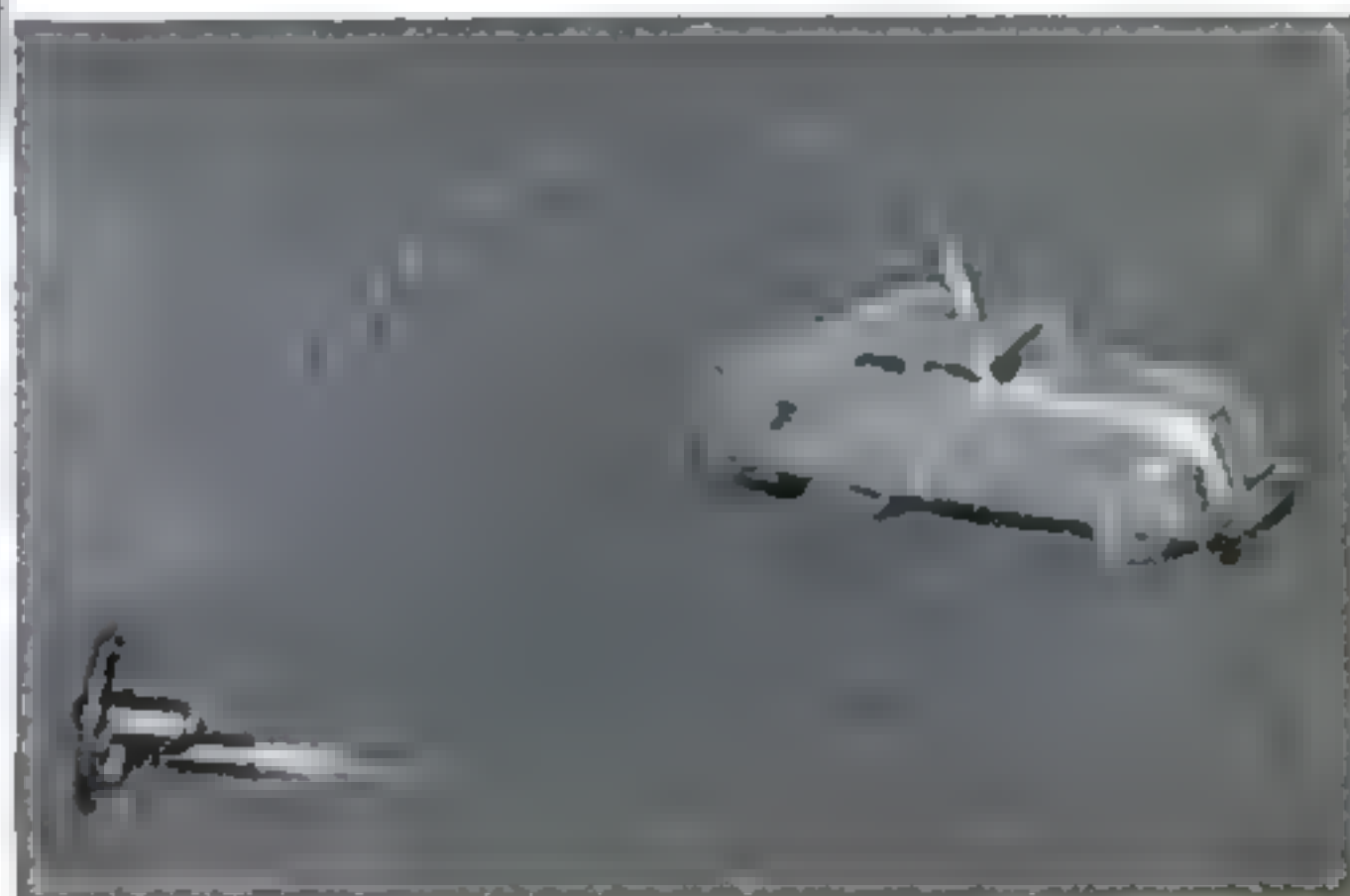
knées comfortably elevated, it is easy to "let go" completely, according to the maker. For carrying the board or storing it in the home when it is not being used, the hinged wooden sections fold compactly.



## Remote Control Steers Toy Car

**BY TURNING** a tiny steering wheel connected to a flexible cable, a toy clockwork-driven car of new design can be guided through intricate maneuvers without stooping or crawling on the floor. A complete outfit includes two of the cars, twelve small pillars for obstacles, and instructions for a number of entertaining games that require skill in steering the toys.

Steering the toys around obstacles makes an exciting game for two players. Right, one of the cars and its tiny steering-wheel control that is held in the hand







## Handy Pram Has Built-in Cradle

BABY won't wake up—a boon to a busy mother—when lifted from a new baby carriage of English design. The whole interior of the carriage forms a detachable cradle that may be removed bodily. Convenient straps at the sides serve as handles for lifting the cradle with the baby in it, or replacing it in the carriage, as demonstrated in the illustration below.

How a baby is lifted from the new English carriage without being disturbed

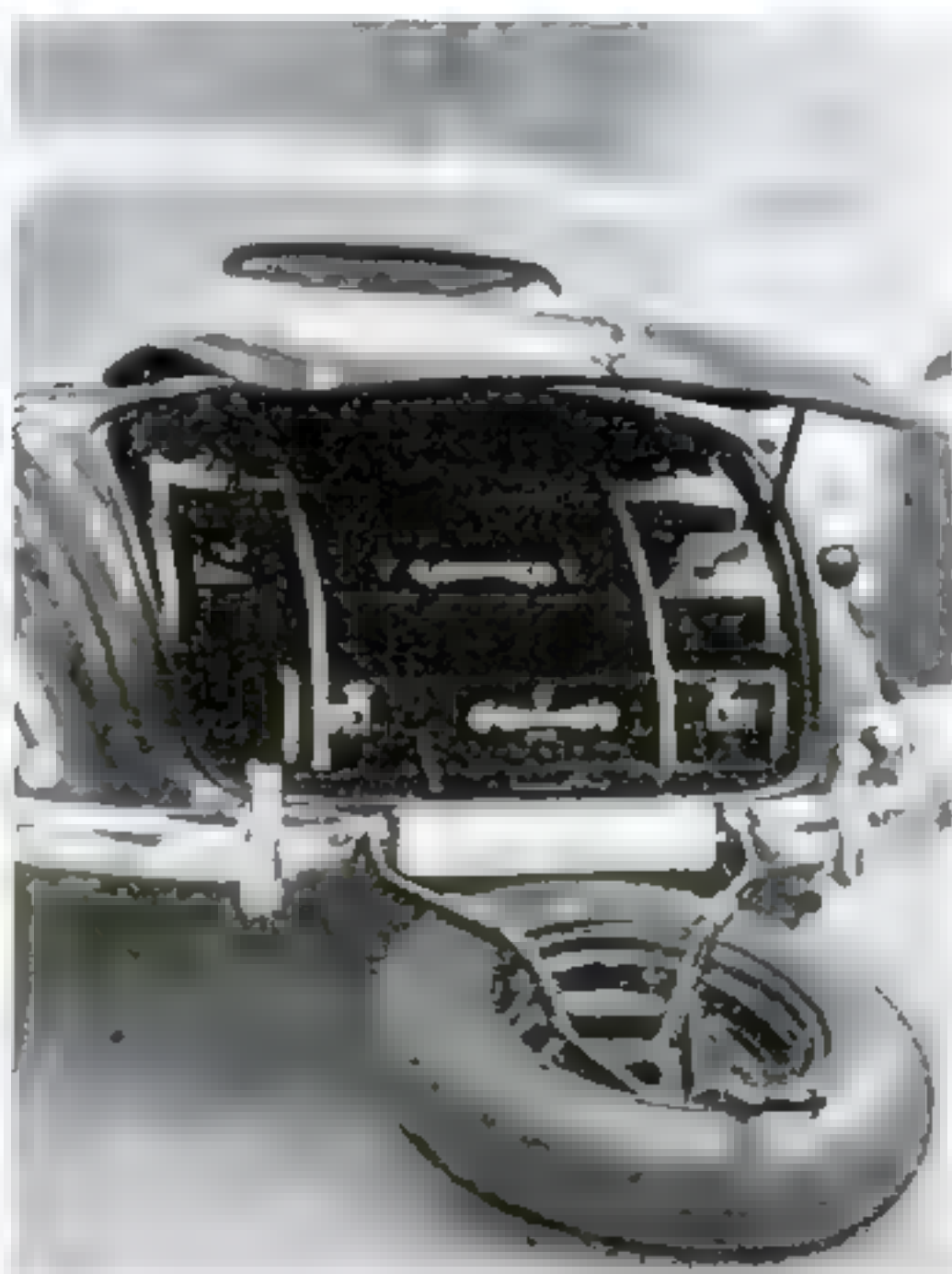


## Precious Metals Used To Solder Porcelain

GOLD and platinum make it possible to solder porcelain to metal, in a process just perfected by Westinghouse engineers, and used to make leakproof joints between porcelain insulators and the metal cases of oil-filled transformers. Applied to the spinning insulator with a brush, a colloidal solution of the precious metals is transformed into a gold-platinum film by heat. Then the metallized insulator is dipped in molten solder, and united to the metal case with a soldering iron.



A washbasin built into the fender of the car at left makes it easy to clean up after changing a tire. The car at the right has an extra-big luggage compartment

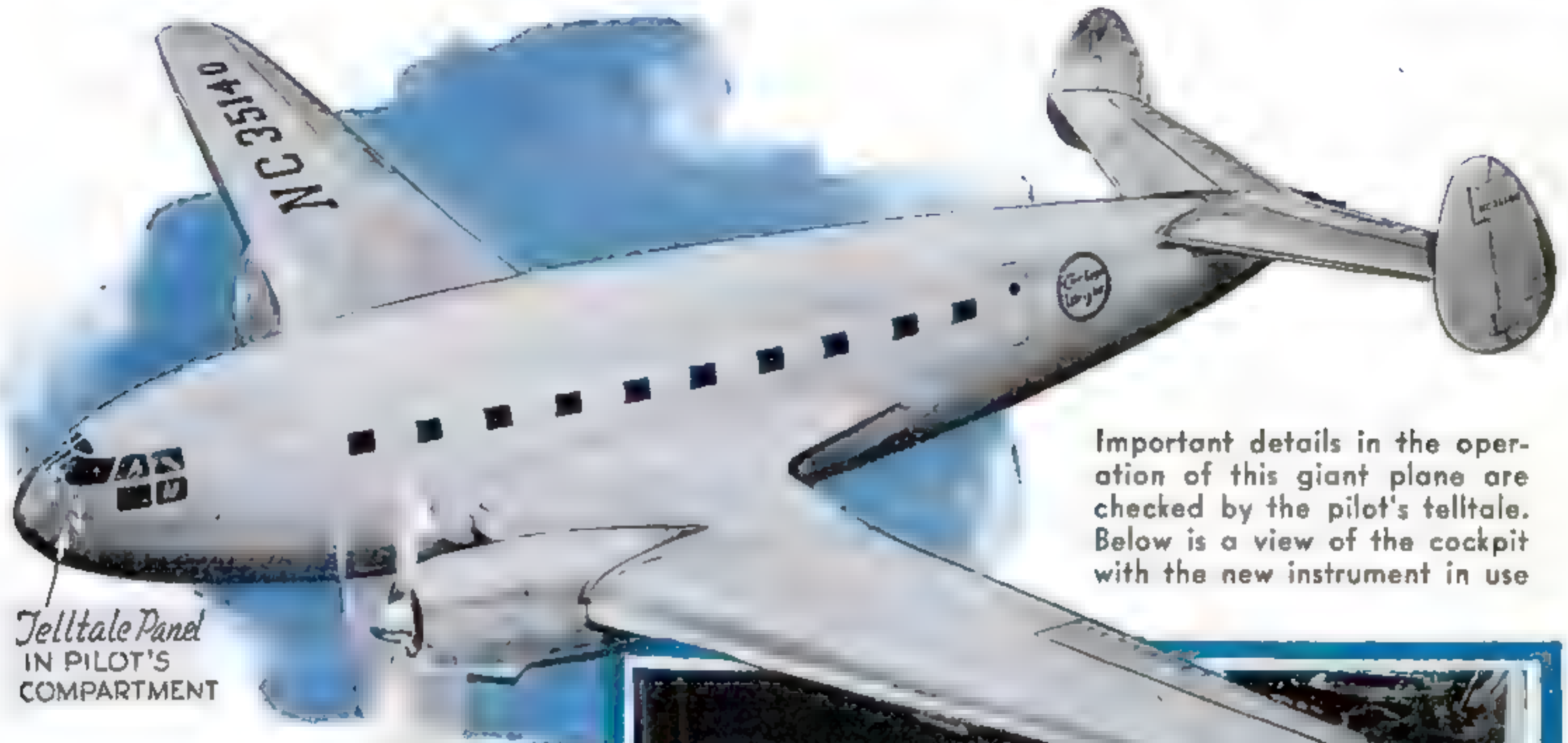


## De Luxe Autos Have Special Touring Aids

DE LUXE cars exhibited at a recent foreign auto show offered several unusual conveniences for long trips. One model has a folding washbasin built into a fender and fed by a concealed reservoir, permitting tourists to wash up by the roadside. Another has the spare tire on a hinged bracket that may be lowered to open a big luggage compartment.

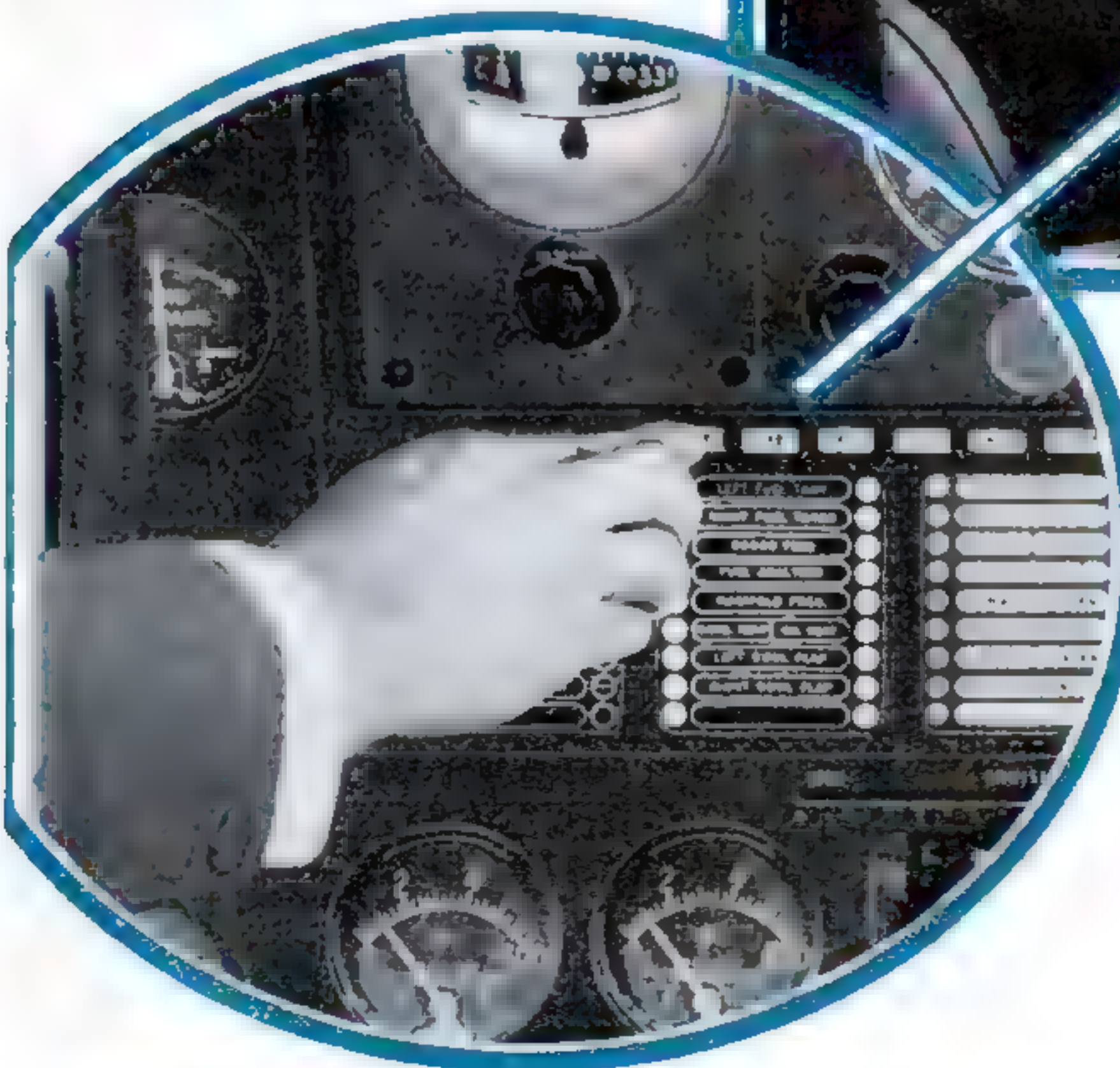


# Telltale Safeguards Big Plane



Important details in the operation of this giant plane are checked by the pilot's telltale. Below is a view of the cockpit with the new instrument in use.

**A**UTOMATICALLY checking the functioning of each of forty-seven separate operating details, an amazing electrical telltale panel installed in the cockpit of an eighteen-ton, twin-motor transport plane now nearing completion, flashes on indicating lights to warn pilots of instruments, controls, or vital parts of the plane that need adjustment.



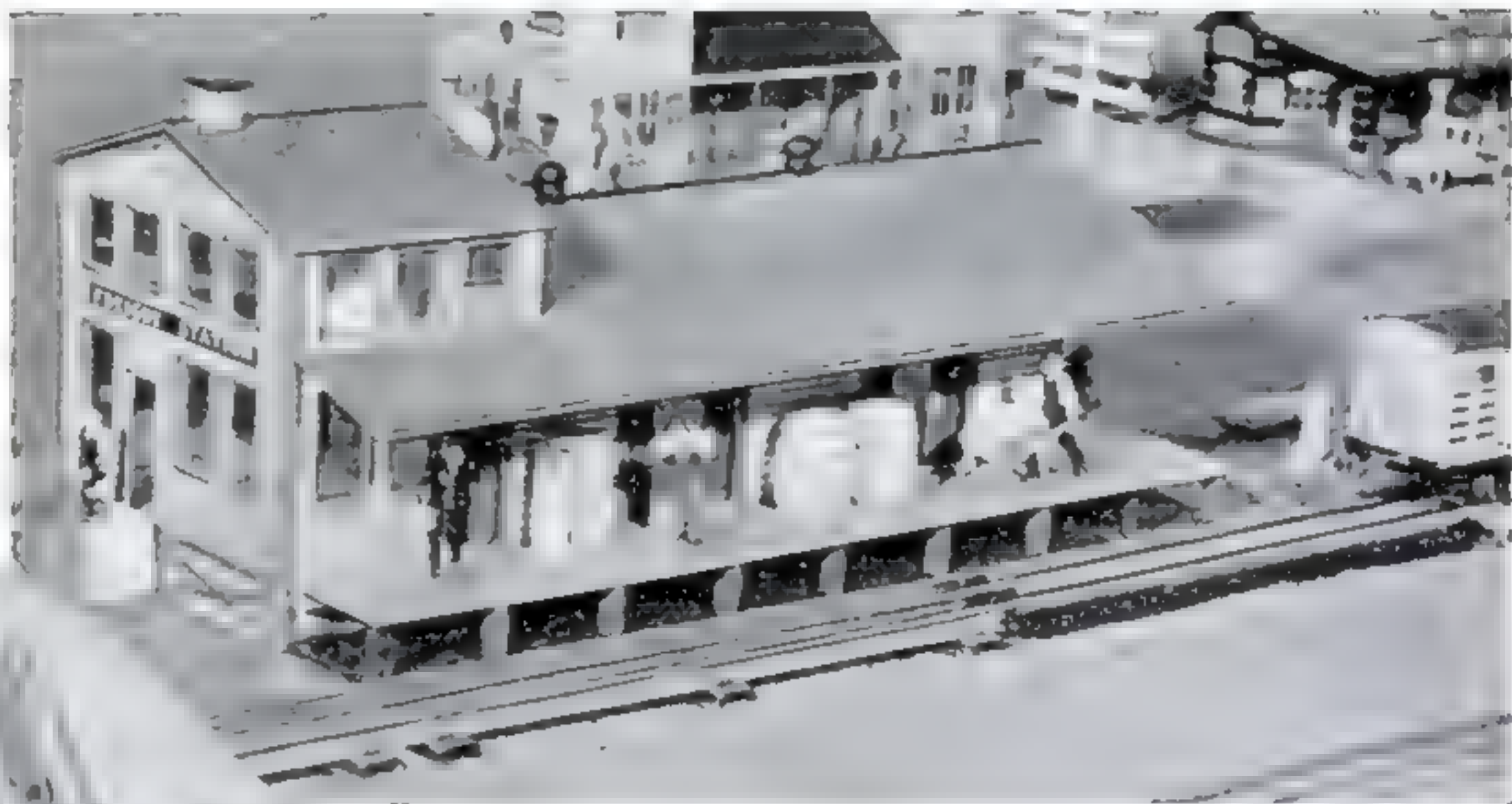
Conveniently placed in the center of the cockpit instrument panel, the device has ten preselector switches for every plane maneuver, from starting the motors and taxiing, to cruising, landing, and slowing to a stop. When a pilot prepares to land, he presses the appropriate switch on the panel. Instantly, lights flash on to remind him of the necessary adjustments that must be made. When landing gear has been lowered into place, the telltale light for that operation blinks out. As landing flaps, ailerons, and elevators are adjusted, their corresponding warning lamps on the panel disappear, until the entire panel is dark.

Before starting a maneuver, the pilot presses a button. Lights flash on to remind him of all the controls that must be adjusted.



# Model-Railroad Village in Kits

A finished scale-model station. Below, assembling one of the houses



**C**OMplete in every detail, scale-model buildings in kit form are now available at moderate cost to model-railroad enthusiasts. The buildings are copied from actual railroad structures to an exact scale of one quarter inch to the foot, and are easily assembled by following the detailed instructions supplied with each kit. Besides the freight station shown in the photograph above, a signal tower, and a passenger station, the manufacturer offers models for a complete village, including a factory, church, school, and houses.

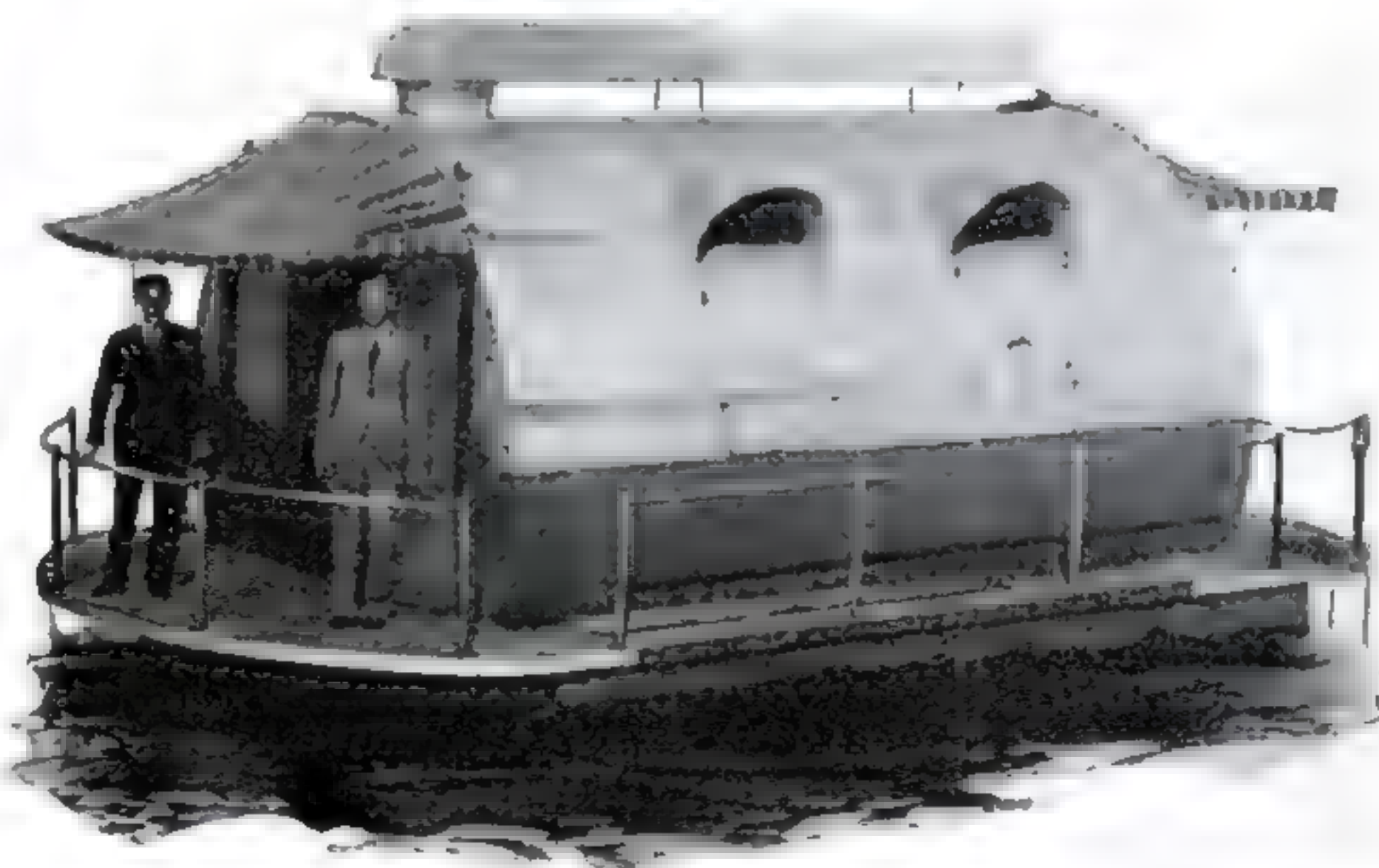


## Handy Ammeter

ALTERNATING current flowing through large electrical conductors in power stations can be accurately measured without breaking the circuit by clamping on the magnetic ammeter shown above.

## House Boat Is an Old Oil Tank

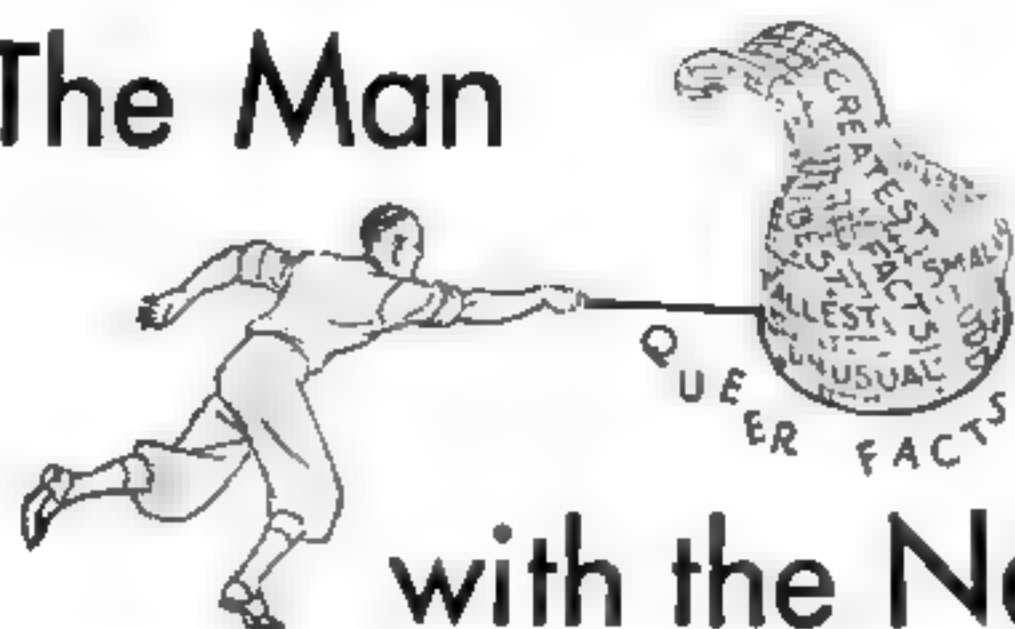
MADE from an old 20,000-gallon oil tank, an unusual four-ton house boat built by Rene Tatro, of Kankakee, Ill., skims along the water at almost ten miles an hour. Powered by an old automobile engine, the curious craft has twin propellers and is balanced by five steel drums below the water level. Windows were cut out with an acetylene torch.



Made from an oil tank, the house boat has a speed of eight knots



## The Man



## with the Net

BOOKS in the main New York Public Library fill eighty miles of shelves.

MINNESOTA extends farther north than either Maine or Washington.

BOMBPROOF paint, resistant to incendiary chemicals, has been developed by English scientists.

MOUSE-EATING grasshoppers live in the Belgian Congo.



LITTLE flies never become big flies, because a winged adult insect does not grow larger.

APPLE SIRUP has been put on the American market as a rival of maple sirup.

INDIANAPOLIS, Ind., adopted the first laws against jaywalking.

HONEY of 119 kinds was recently displayed in one New York City store.

MACHINE-GUN barrels have an average useful life of 1,000 seconds.



SINUS cavities vary so much in different individuals that experts believe X-ray pictures of them could be used like fingerprints for identification.

BIRDS oftentimes have eyesight 10,000 percent keener than ours.

GAS MASKS made of paper have been developed in Finland.

PORK is the favorite American meat.



## "Mail Box" for Telegrams Transmits Messages

TELEGRAMS are transmitted automatically by a photo-electric facsimile machine housed within a compact wall box, as shown above. Messages are written on special blanks, which are deposited in the telegraphic "mail box" through a slot. Here the blank is automatically wrapped around a transmitting cylinder and the message sent like a wire photograph.

## Fish Are Taught Tricks

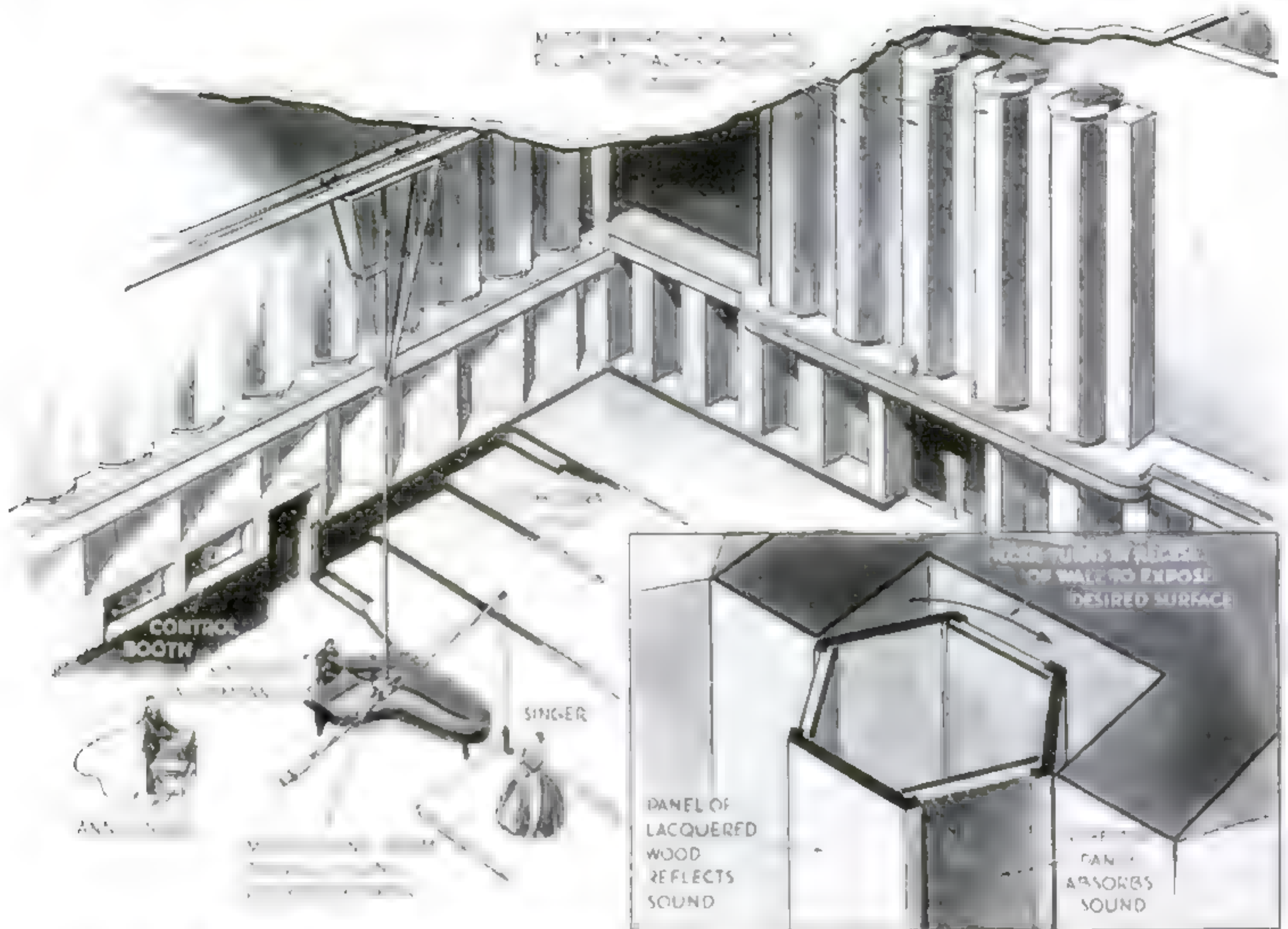
FISH have memories, and can be taught to perform tricks, according to Dr. Mieczyslaw Oxner, ichthyologist at Europe's oldest aquarium, in Monte Carlo. Two months are required to train a fish to eat out of your hand, Dr. Oxner declares. Below, some of his finned pupils are shown "jumping" through a hoop.



Fish "jumping" through a hoop for their trainer



# Radio Studio Uses Moving Walls



By rotating the hexagonal pillars set into the walls, any desired acoustical qualities can be obtained

**N**EW departures in acoustics confront a visitor to a monster broadcasting center just completed near Brussels, Belgium. "Moving walls" in one studio, where singers, orchestras, and light opera are put on the air, enable sound engineers to alter its

acoustical properties completely in thirty-five seconds. Recesses along the walls hold forty-seven hexagonal pillars, fifteen feet tall and about a yard in diameter, that may be rotated independently or in unison by individual electric motors. Each pillar has three faces of lacquered wood, which act as sounding boards, and three asbestos faces that deaden sound. By turning the pillars to various positions, reverberation in the studio may be reinforced or suppressed at will, without recourse to more conventional means such as sound-absorbing draperies. Microphones on overhead rails may be shifted easily to any part of the building's largest studios, which include the biggest one in the world—a grand auditorium for broadcasting symphony-orchestra concerts. Each of the nineteen studios in the center has its individual heating and air-conditioning plant.



Exterior of the new broadcasting center near Brussels, Belgium





## Big Kites Form Barrage for Air Defense

WILL kites, with their trailing cables, prove an effective obstacle to invading planes? The picture above shows German soldiers preparing to test the odd scheme. According to earlier reports, Germany intended to adopt the British plan of a "balloon barrage"—a

network of captive balloons with hanging cables to entangle air raiders—for protecting its western frontier and interior industrial plants against approaching hostile aircraft. Apparently difficulties have developed with the program, and kites are now being tried.

## Spring in City's Park Spouts "Radium Water"

AMERICA'S third-biggest metropolis may possess a valuable radium mine. Its city fathers recently learned to their surprise that Fairmount Park, Philadelphia, contains the country's most radioactive spring, when Dr. J. Lloyd Bohn, Temple University physicist, tested the water that gushes from it. What interests him about the spring is not the curative powers sometimes claimed for such waters, but the possibility that a rich natural deposit of radium may be found near-by.

## Left-Handed Can Opener

LEFT-HANDED persons will particularly welcome a can opener just invented. It operates by a crank which turns in either direction with equal can-opening efficiency. In addition, it has a built-in magnet that prevents metal particles sheared from the can from dropping into the contents.



Sampling the radioactive water found in a park spring



Parts of a fourteen-cylinder, 950-horsepower naval airplane engine distributed on a rack that has a special place for every part. The compartments are made to fit

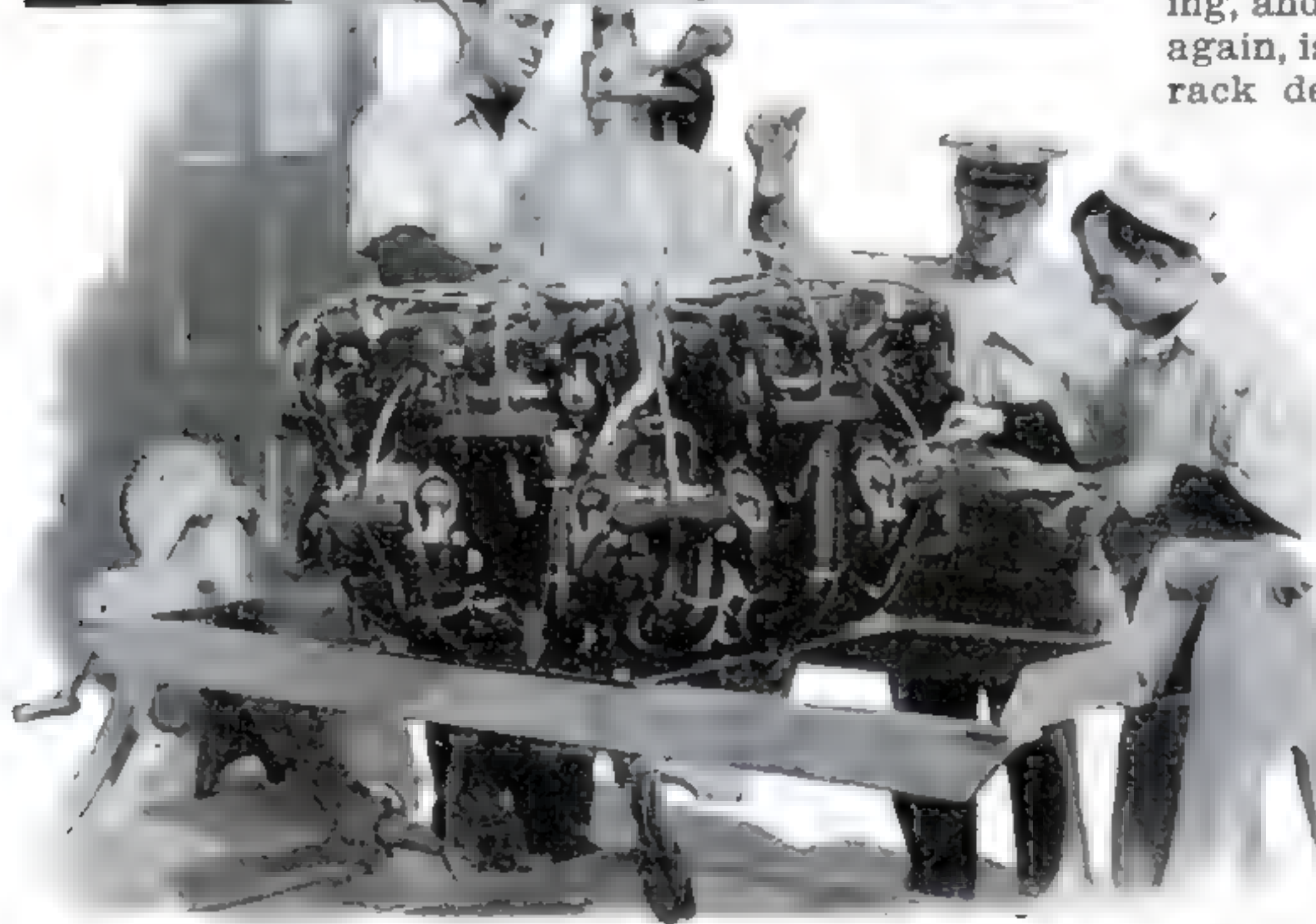


Below, master rod being put into its place in the rack



## Rack Holds Parts of Plane Motor for Overhauling

THE intricate job of tearing down an airplane engine for overhauling, and then getting it back together again, is made easier by a novel parts rack devised by John S. Schwarz, chief aviation machinist's mate in the U. S. Naval Reserve station at Floyd Bennett Field, New York City. In addition to small trays and compartments for nuts, bolts, and small parts, the rack has three large rectangular sections made so that each part has its own slot, peg, notch, or hole into which it fits, thus reducing the chances of error when they are finally reassembled. Building the rack was a two-week job. Schwarz dismantled a fourteen-cylinder engine and accurately cut places for all the parts.



Mechanics checking the timing of a motor after it has been reassembled





Fitted to a patient's jaws, the "gnathograph" registers the arrangement of teeth and direction of bite

WITH the aid of the "gnathograph," an instrument as mouth-filling as its name, a dentist's patients may now be assured of a perfect fit for artificial teeth. Fitted to the jaws as shown above, the new device registers the arrangement of the teeth and the direction of the "bite," to guide the dentist in straightening teeth or fitting inlays, crowns, bridges, and plates. Its inventor, Dr. Beverly B. McCollum of Los Angeles, Calif., demonstrates in the picture at the right how the instrument is then mounted for use in tooling a plate to just the right shape to give the most comfortable fit in the mouth.



The device then serves as a guide in making plates



## Spare Tire Inflated by Extension Tube

EVEN a spare tucked away in a trunk compartment need not be neglected when a motorist checks the air in his tires. A car maker has introduced the handy extension air line shown above, which permits the spare tire to be tested and inflated without opening the trunk.

## Buns Sliced by Electricity

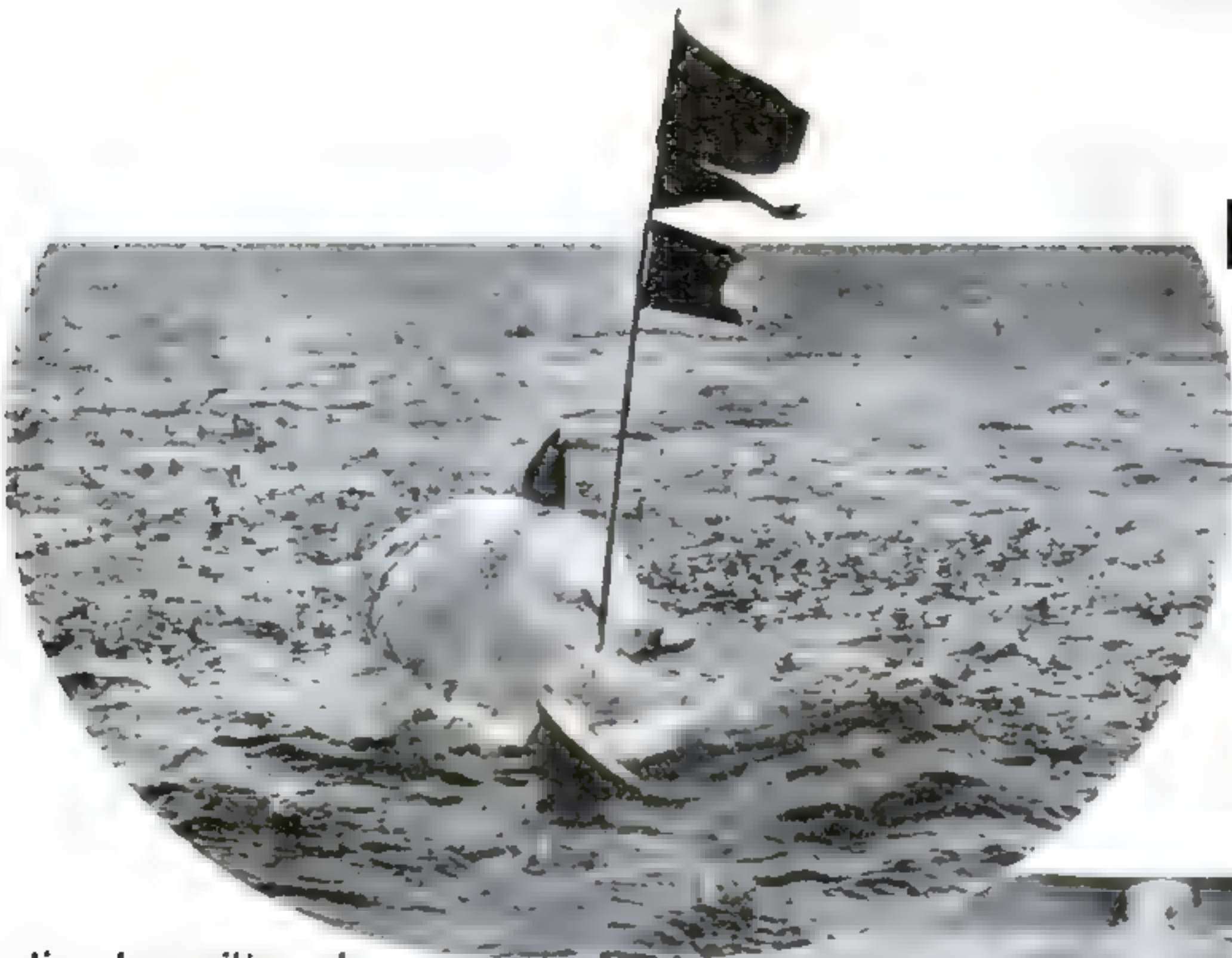
AS FAST as they are placed in the machine, rolls and buns are sliced by a new electric aid for restaurants and hotels. Adjustable for different sizes and shapes of rolls, the device stops short of cutting them completely in two by any desired fraction of an inch.



Fed into the top of this machine, buns come out neatly sliced

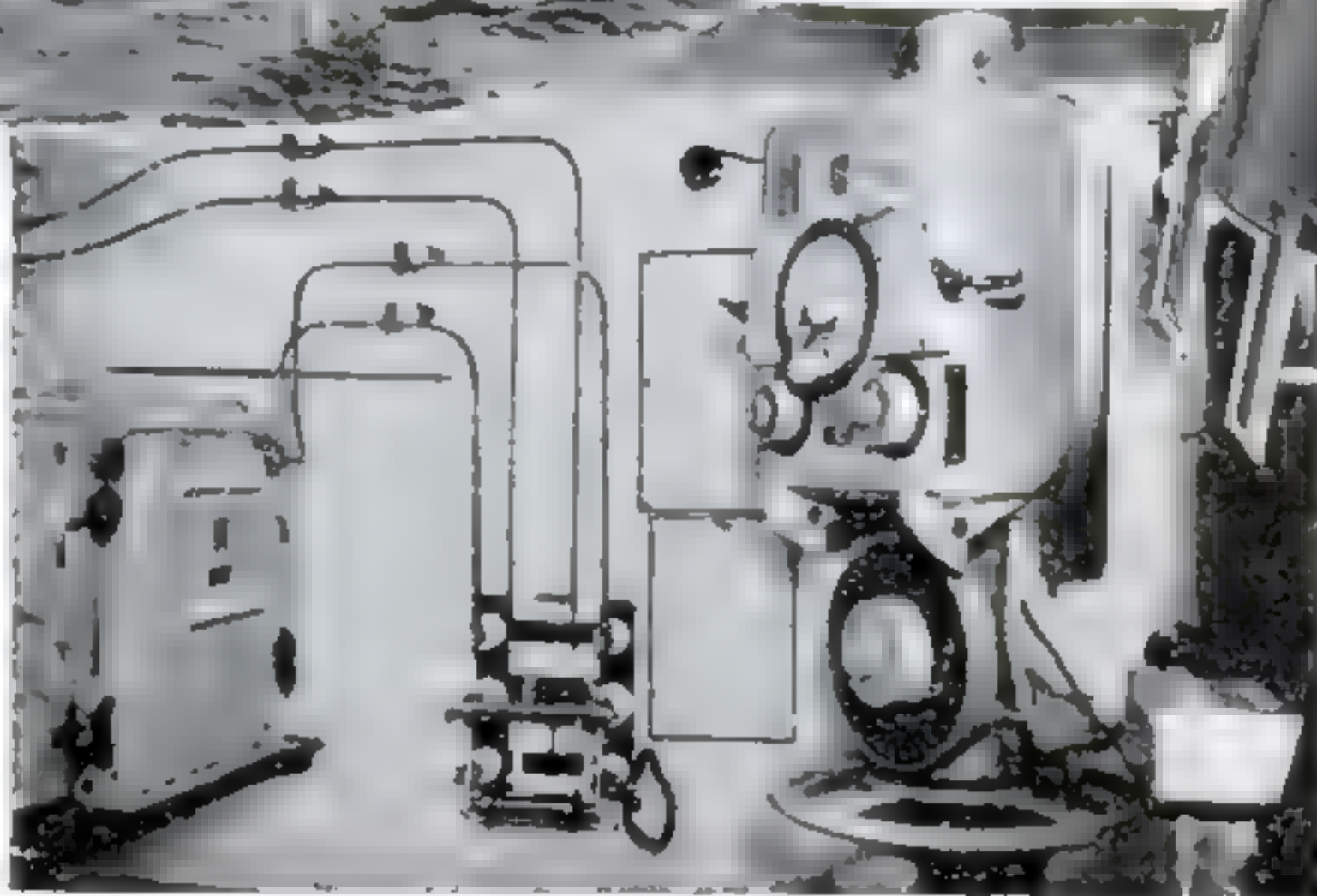


# Radio Beacon Is Marker for Dead Whales



A tiny transmitter attached to the pole on the whale sends signals

**R**ADIO listeners who hear strange signals may have tuned in on a dead whale. A Scandinavian concern has recently produced an automatic radio transmitter which can be attached to the flagpole marking the floating carcass of a harpooned whale, so that its position can be determined at any time by the direction-finding radio equipment on the whaling ship which will later haul it aboard. The one-tube, battery-operated transmitter is housed in a water-tight metal box less



Above, the transmitter. Left, direction finder aboard whaler that guides the ship to the carcass

than two feet long. Identifying signals are broadcast from it at specific intervals, and a special receiving instrument rings an alarm bell on the whaler whenever an expected signal fails to arrive at the prearranged time.

## Pivoted Straightedge Aids Engineers

TO AID in drawing engineering graphs, a new type of ruler provided with a tightly stretched wire that serves as the straight-edge is mounted on a pivot so that it can be rotated easily around any desired point. A round weight holds the ruler in place, while a sight simplifies the problem of placing the straight-edge directly over a point on the graph for drawing lines.





## Stop Light on Club Aids Golfers

A NOTED British scientist, Prof. A. M. Low, has turned inventor to produce a golf club for beginners to use in putting practice. Clipped to the shaft of the putter, a red light automatically flashes on if the novice deviates from the perfect "pendulum" stroke employed by experts. By making repeated trials, until he can keep the lamp from lighting, the learner masters the stroke.

## Hens' Nests Get Shock Absorbers

SHOCK absorbers for hens' nests are a strange by-product of vast engineering projects. When residents at the site of the Grand River Dam, near Disney, Okla., discovered that dynamite blasts were keeping eggs from hatching, a local inventor went to work on the problem. His solution was to place the nests on bed springs, which cushioned the shock of the explosions and so saved the eggs.

## Motor Runs Power Dustpan

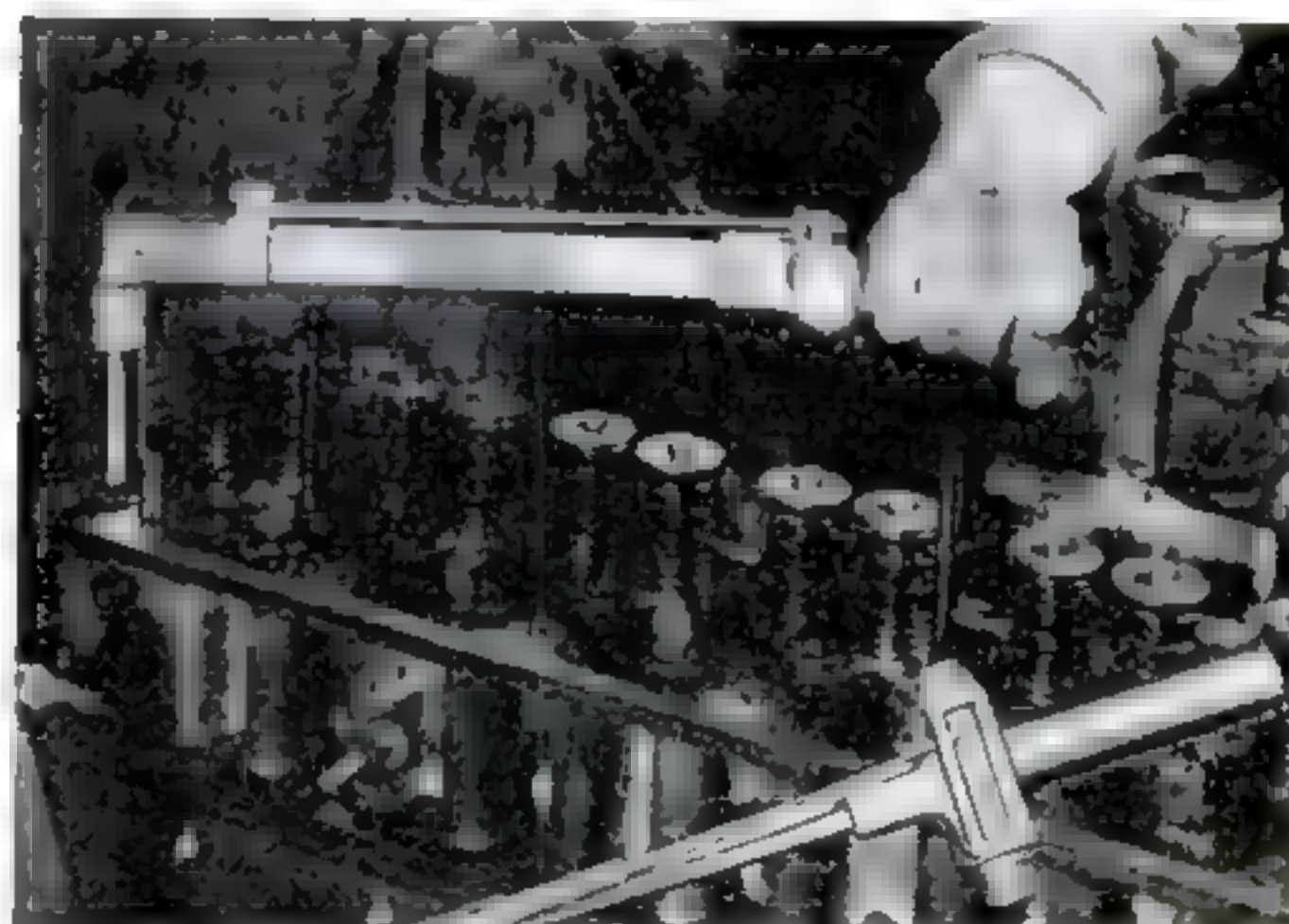
PROPELLED by a gasoline motor at a speed of three miles an hour, a new "motorized dustpan" makes short work of sweeping a factory floor or city street. Equipped with any type of broom

from soft fiber to stiff wire, depending on the use intended, the pneumatic-tired machine can turn in its own length, and can pick up dirt from within only an inch and a half from a wall or curb.

Motorized dustpan in use. A rotary broom sweeps surface clean



If the stroke is not correct, the light flashes on



Set for the tension desired, this device signals a warning when the nut is tightened

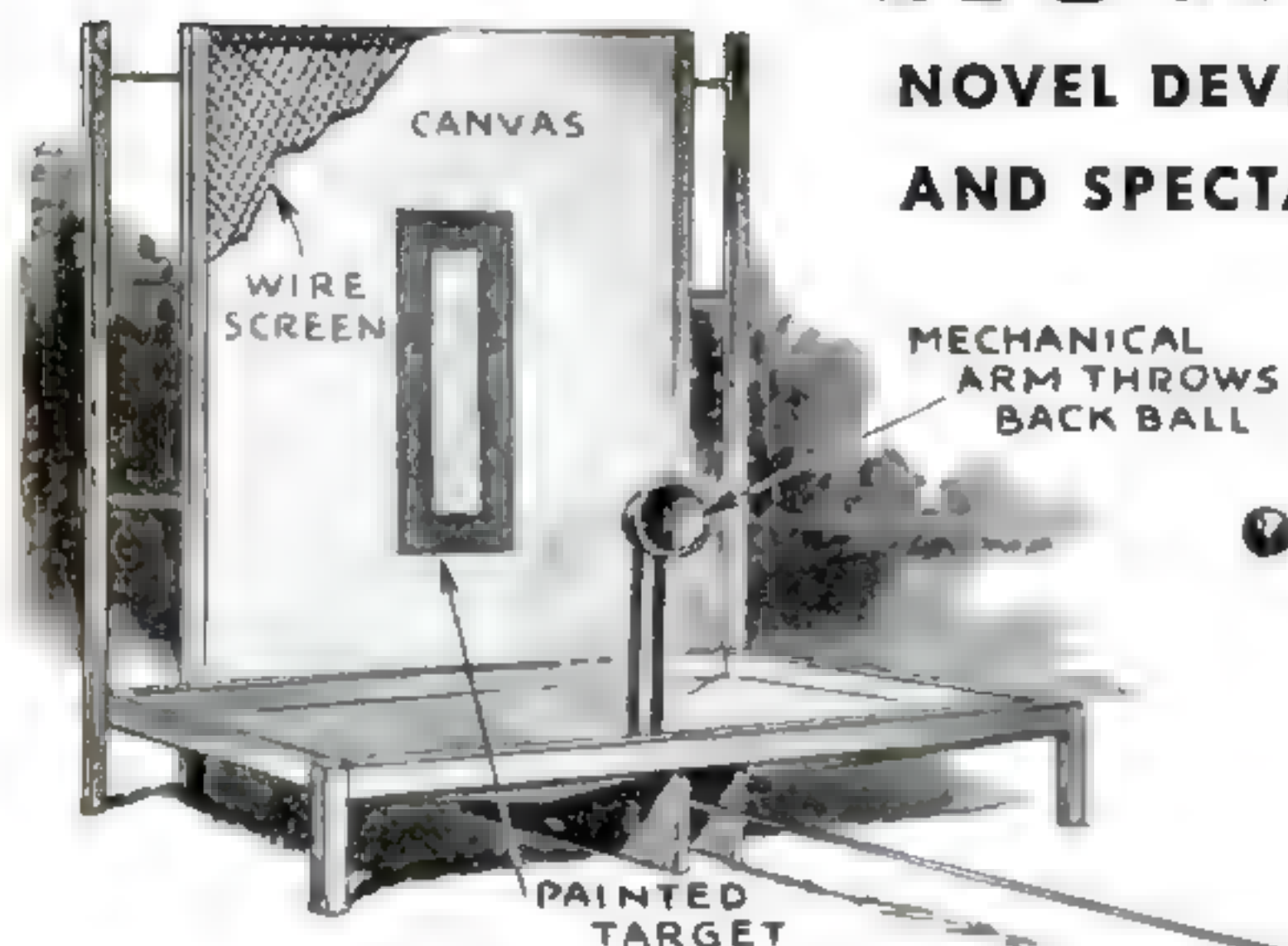
## Wrench Measures Tension for Tightening Nuts

TIGHTENING nuts to exactly the proper point is made easy by a new precision tool for auto mechanics. Employed as a socket-wrench handle, after its pointer has been set to the right tension, it flashes a red light to tell the user when to stop pulling. Turning a dial selects any one of five scales, including recommended pulls for spark plugs and for U.S.S. and S.A.E. bolts. A replaceable flash-light bulb and dry cells provide the light.



# New Inventions

NOVEL DEVICES PROVIDE THRILLS FOR PLAYERS AND SPECTATORS, AND GIVE AID IN PRACTICE



**PITCHING PRACTICE** is simplified by this new device, consisting of a canvas screen with a black rectangle for a target. After each throw, the spent ball drops into a hopper at the base. To get it back, the player steps on a pedal and a mechanical arm tosses the ball back to him



**RACING CREWS** learn to row circles around their opponents with this merry-go-round training machine. Fastened to the rim of a revolving platform, twelve "boats" run on wheels around a circular track as rowers ply the oars. The drawing shows construction of the unit in a lake



**N**EW thrills for players and spectators, and novel aids for practice, are provided by the latest inventions in the field of sport.

Polo becomes an exciting aquatic game when played on mechanical steeds, skimming the water under the power of husky outboard motors. A ring-shaped grip controls throttle and rudder, leaving the player with one hand free to strike the floating ball.

In baseball games, a new electric umpire takes the guesswork out of call-



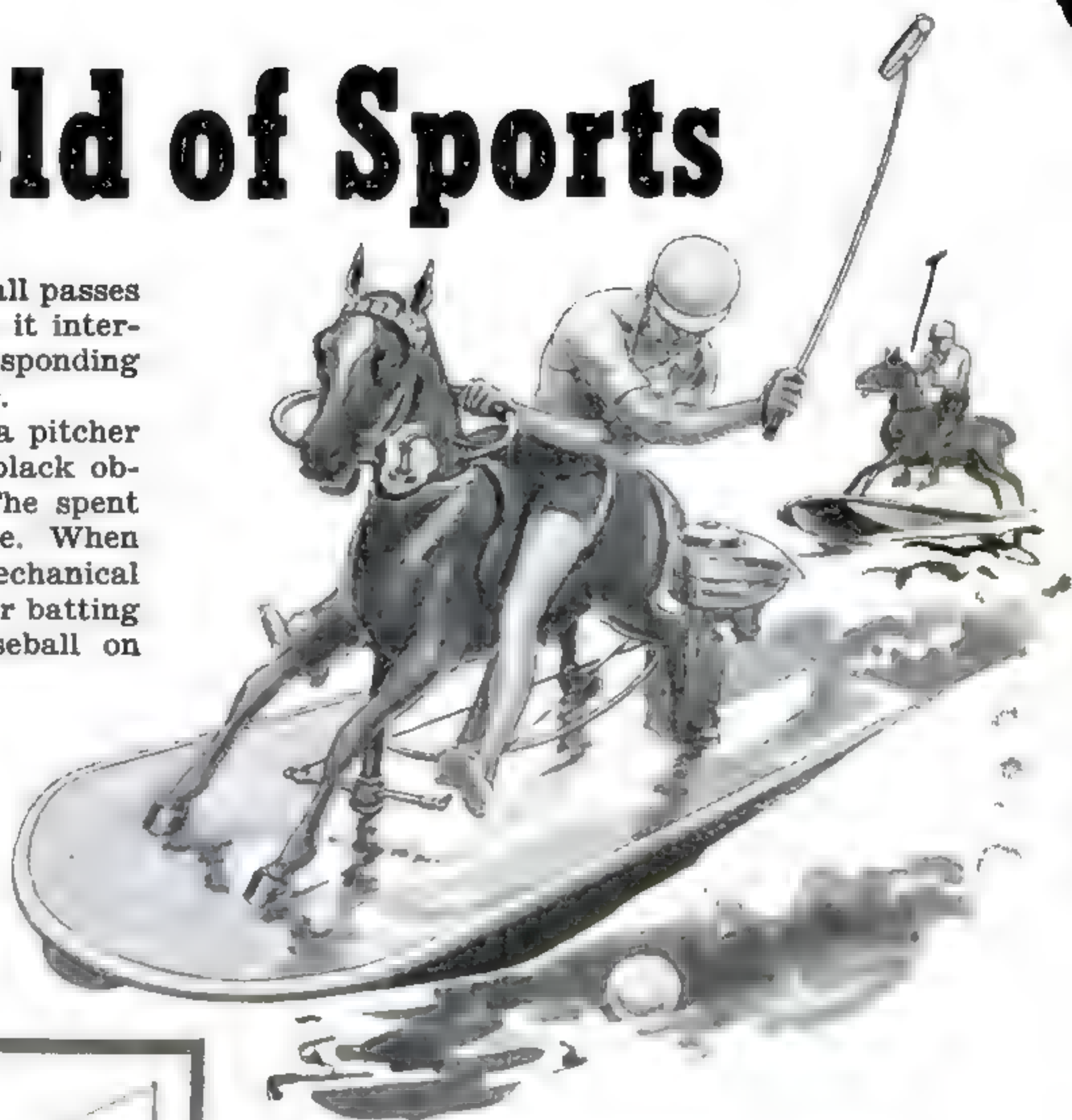


# in the Field of Sports

ing "balls" and "strikes." When a ball passes over the plate at the proper height, it intercepts two light beams, actuates corresponding electric eyes, and lights an indicator.

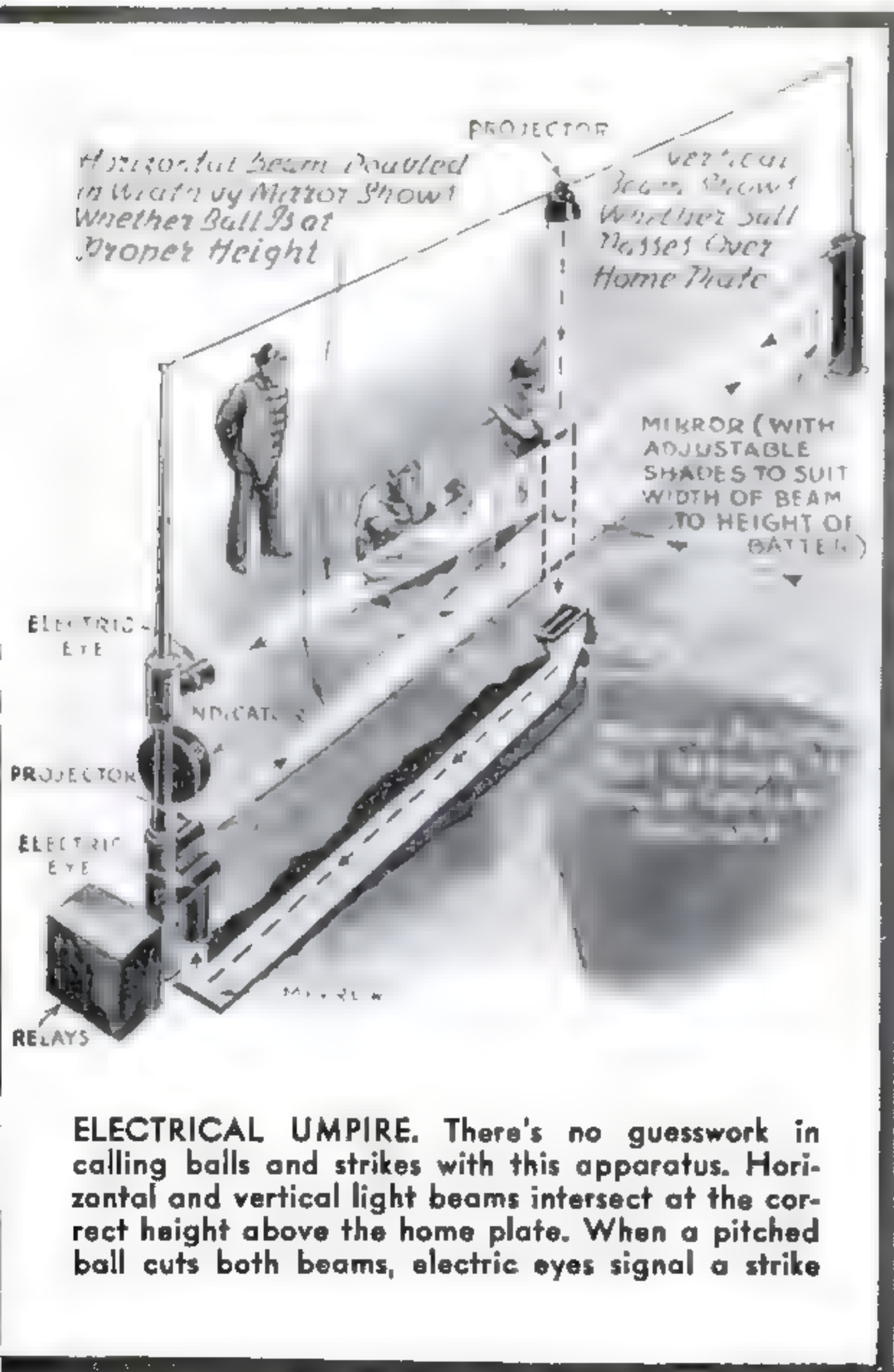
With another baseball invention, a pitcher can practice without a catcher. A black ob-long serves as a practice target. The spent ball drops into a pocket at the base. When the pitcher steps on a pedal, a mechanical arm throws the ball back to him. For batting practice, a new aid tethers a baseball on a cord running over pulleys.

In Asheville, N. C., a merry-go-round rowing machine trains racing crews handicapped by the short practice courses available. Fastened to the rim of a revolving platform, twelve "boats" travel on wheels around a circular track.



**POLO ON WATER** is a thrilling new aquatic sport. Players are mounted on dummy horses that skim over the water under the power of outboard motors. "Bridle" rings control rudder and throttle

**BETTER BATTERS** are the goal of the practice device below. The player swings at a ball which is tethered to the wooden frame by means of a cord running over a series of pulleys, as shown



**ELECTRICAL UMPIRE.** There's no guesswork in calling balls and strikes with this apparatus. Horizontal and vertical light beams intersect at the correct height above the home plate. When a pitched ball cuts both beams, electric eyes signal a strike







## Odd Shipyard Builds Vessels in Miniature

ORDERS from all over the world pour into a novel shipyard in Berlin, Germany, where vessels of all nationalities and of all types, from the smallest sailing sloops to gigantic ocean liners and naval dreadnoughts, are carefully copied from plans and turned out in scale-model form. Complete in every essential detail, including movable gun turrets, cargo derricks, and even tiny radio antennas strung to masts, the model ships are used for advertising purposes, in the case of freighters and passenger liners, and for dummy battle practice in naval schools, in the case of destroyers, submarines, cruisers, and battleships. A typical scene in the unusual shipyard is pictured at the left, with scale reproductions of passenger vessels lined up at tiny piers jutting out into glass "water."

Accurate scale models of real steamships in miniature docks in a German shop where vessels of all kinds are reproduced. Plate glass represents water

At the left, a workman is drilling a hole for mounting one of the movable turrets on a tiny battleship. Below, putting the finishing touches on a model of the "Bremen"



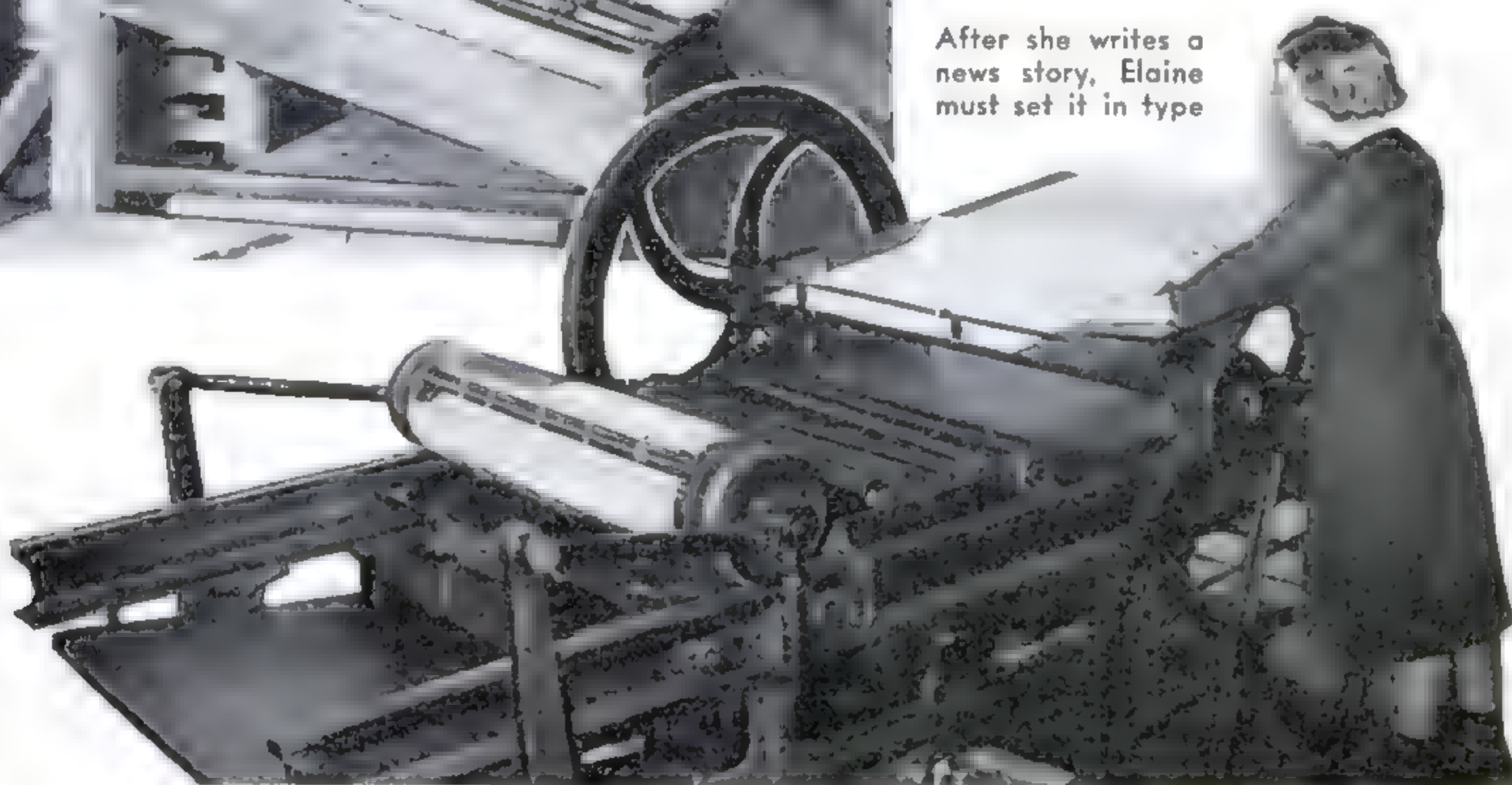


# Young Girl Runs Successful Newspaper

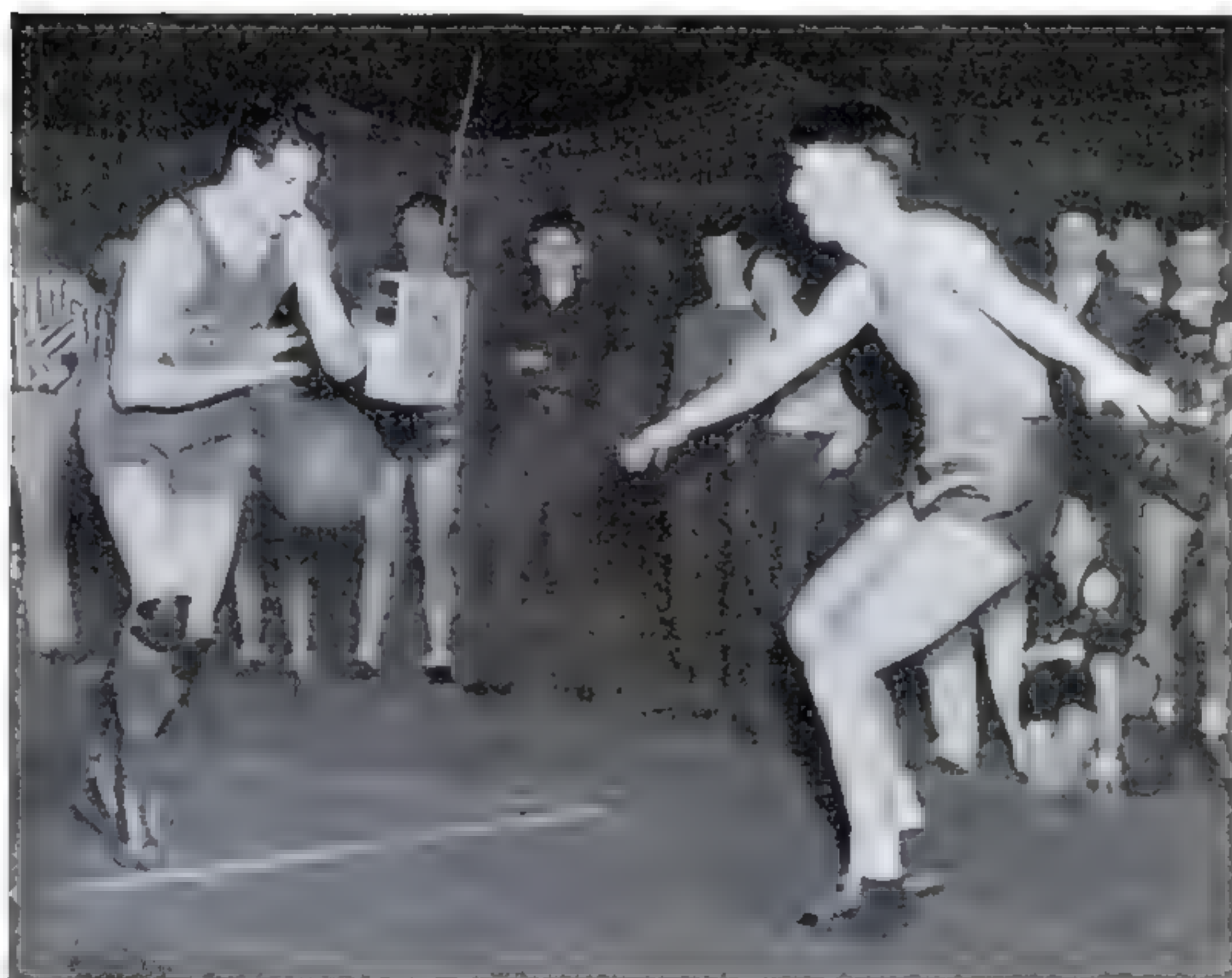


WHEN fifteen-year-old Elaine Stiles took over the editorship of the "Kingston Spy," Kingston, Wis., weekly newspaper, two years ago at the death of her father, readers shook their heads doubtfully. Elaine, however, refused to be discouraged and since has been reporter and publisher rolled into one. She solicits ads, sets type, and even runs the press.

After she writes a news story, Elaine must set it in type



The young girl is editor, reporter, and publisher rolled into one. Here she is running the press



Holding a transmitter in one hand, the player describes the game as he plays

## Broadcasts Game as He Plays

A PLAY-BY-PLAY account of a basketball game, broadcast by one of the actual players during the contest, recently went on the air at Cleveland, Ohio. For the radio stunt, the player-announcer carried a short-wave transmitter that required no trailing wires, and the central radio studio picked up and rebroadcast his exciting description of his own plays and those of his team mates and opponents. The picture shows him in action.



# SIX TIMESAVERS

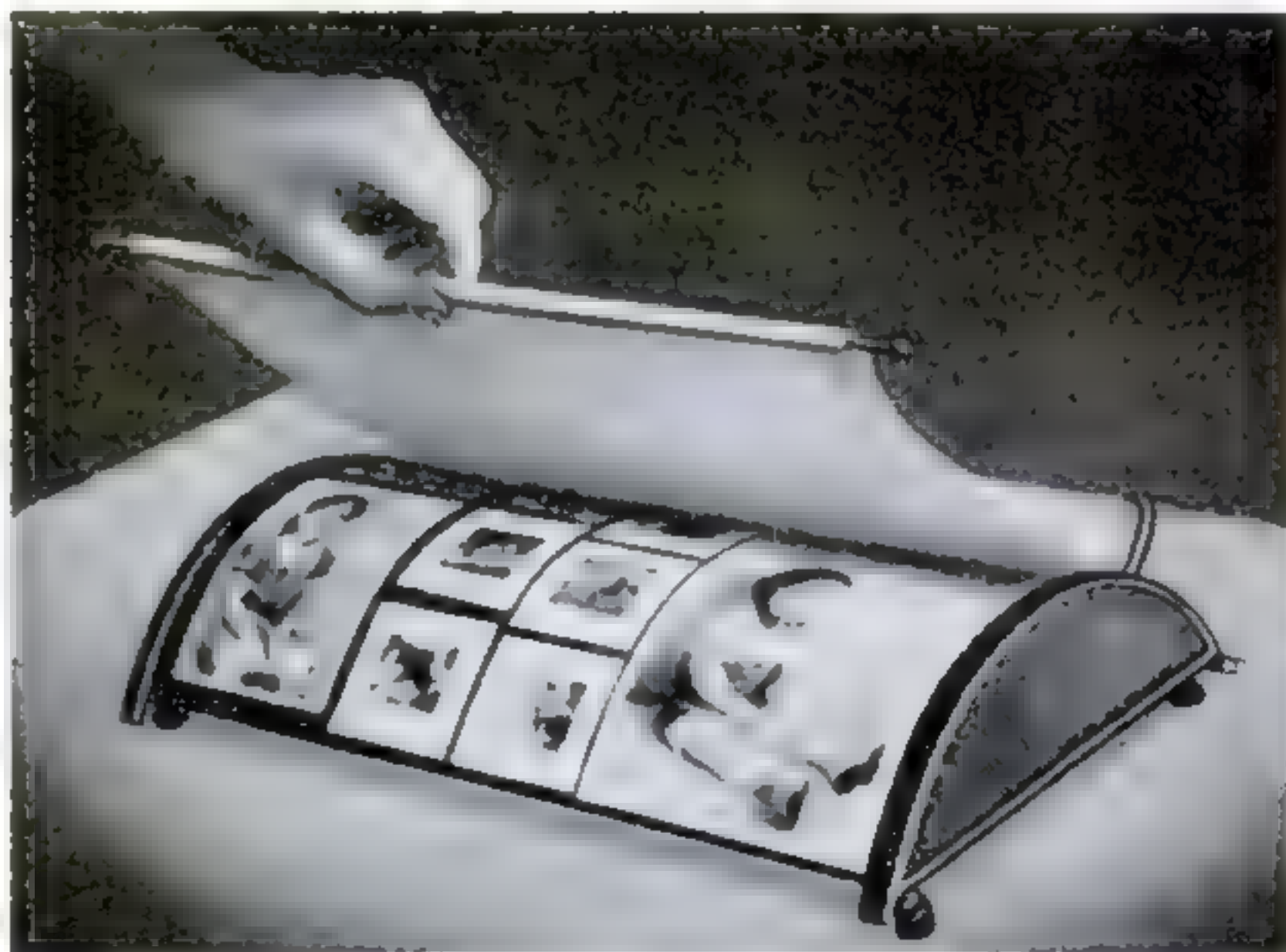


## Photoflood Needs No Reflector

REFLECTOR and photoflood bulb are combined in a new 500-watt lamp that makes it unnecessary to use auxiliary reflectors when taking pictures with artificial illumination. A special aluminum coating inside the bulb, combined with a metallic reflector in the neck, directs light through the inside-frosted circular end.

## Electric Print Drier Cannot Overheat

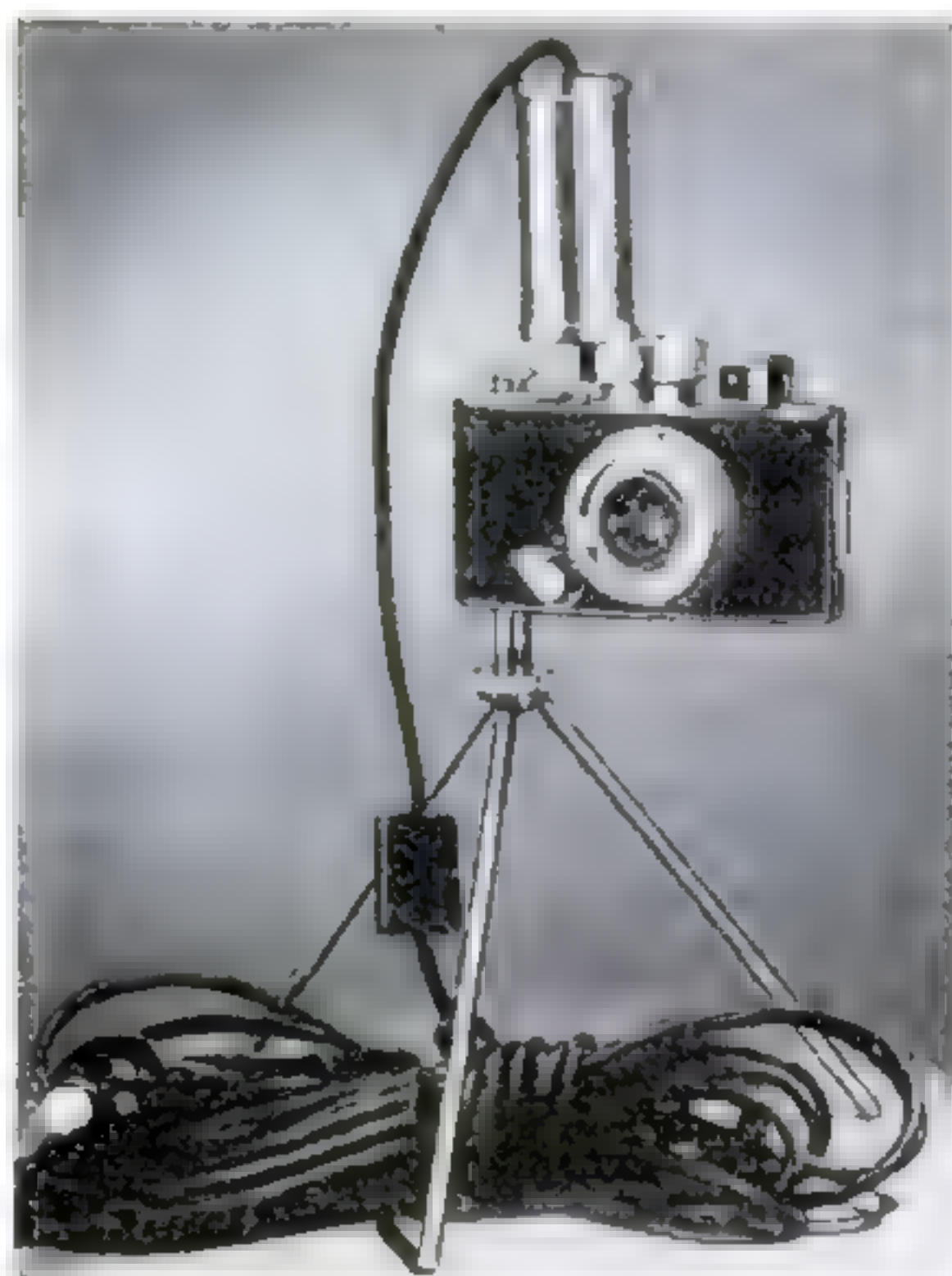
CONTACT prints and enlargements are safely dried on a compact electric drier especially designed for the amateur photography fan. Any possibility of scorching or burning prints is eliminated by a thermostatic control that prevents the 110-volt device from becoming overheated, even though you should go away and leave it. The drier has a drying area of eleven by fifteen inches, taking enlargements up to that size, or a number of smaller prints, in mat, smooth, or glossy finish. It dries prints flat and free of wrinkles, according to the manufacturer.



A thermostat keeps this electric print drier from overheating

## Remote Control for Automatic Camera

QUICKLY attached to the automatic type of candid camera that takes rapid-fire pictures, a remote-control unit just marketed permits the photographer to stand up to fifteen feet from his camera to make a series of pictures. An electromagnet powered by a small dry cell trips the shutter when a button at the end of a light-weight cable is pressed.





# FOR CAMERA FANS

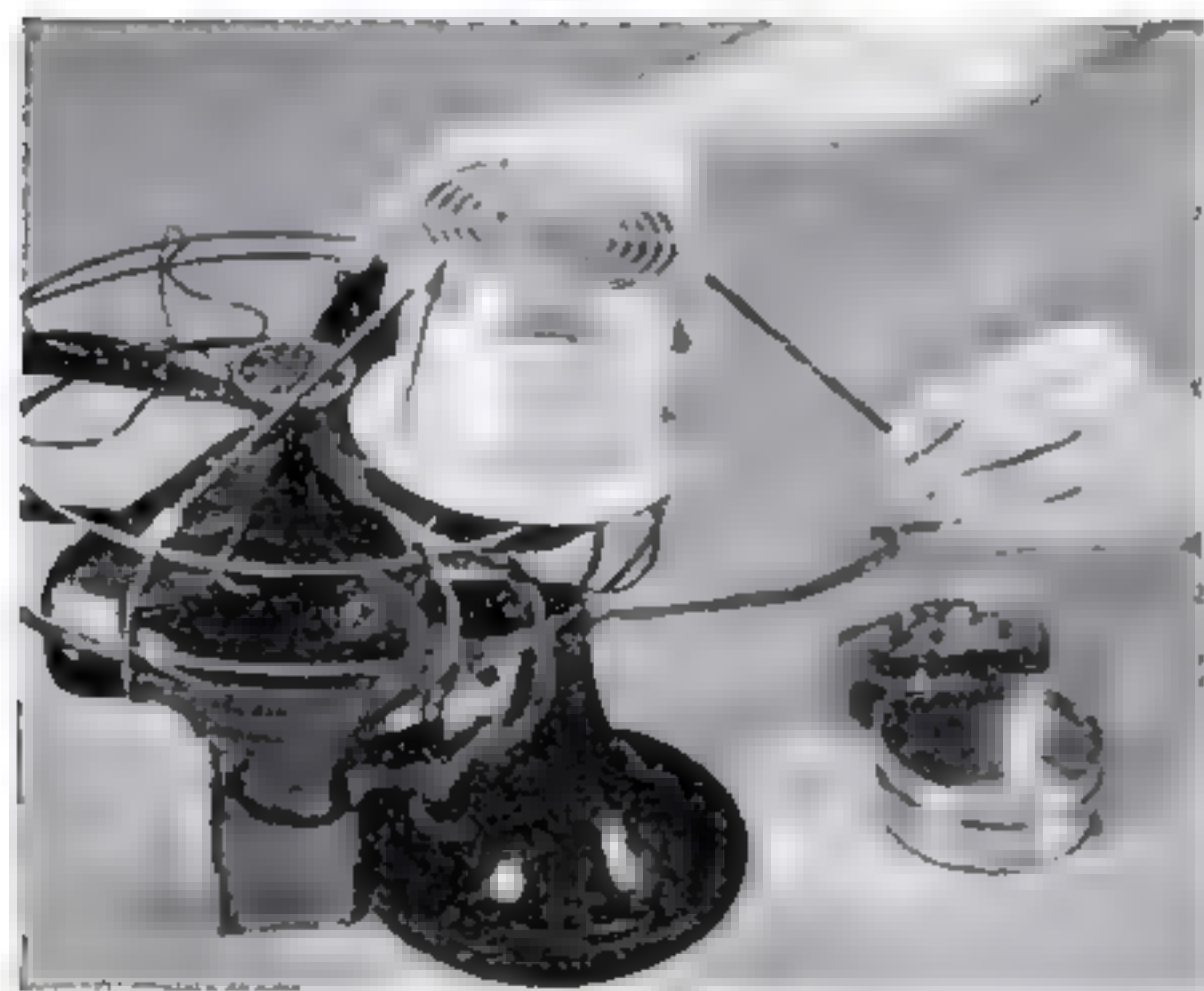
## Portable "Flood-Flash" Outfit Is Powered by Batteries

BULB changing is virtually eliminated with a novel repeating-flash outfit designed for use with miniature cameras. The flash bulb, which can be used over and over again, is turned on for an exposure by the operation of a flash-gun device coupled to the camera shutter. Current for the bulb is supplied by batteries contained in a compact carrying case which is worn on a shoulder strap. The device is intended for cameras having lenses of F/4.5 or faster.

## Lamp Is Built into Camera



DESIGNED to be ready for instant use both night and day, the new inexpensive camera shown at the left carries its own flash lamp. A reflector taking midget-type flash bulbs is built into the top of the camera, along with a holder for two dry cells. The unit may be disconnected when the camera is used for daylight exposures. The camera takes a standard, eight-picture,  $2\frac{1}{4}$  by  $3\frac{1}{4}$ -inch roll film.



Clamped to an electric fan to dry the film, the unit filters air to remove dust

It also filters the washing water. The film stays in the developing spool

## Unit Washes and Dries Film

WITH a new combination film-processing unit, negatives can be washed and dried without removing them from the reel on which they were developed. Both water to wash them and air to dry them are filtered through a fine screen

having 15,000 copper threads to the square inch. So fine is the filter, the makers claim, that all foreign matter and dust are removed from the water and the air before coming in contact with the film. Supplied with the device are a rubber hose with a faucet adapter, and clips to fasten the unit to an electric fan during the drying operation. The apparatus is shown in use in the illustrations at the left.





# Pet Dog Makes Living Fur Piece



Jeanne Lorraine "pins" a corsage to her toy collie, Jiggs. Draped over her shoulders, as below, he passes as a fox skin



**S**IGNS reading "No Dogs Allowed" mean nothing to Miss Jeanne Lorraine, of New York City, since she taught her twelve-year-old pet toy collie, Jiggs, to drape himself around her neck and masquerade as a fur piece. The trick first worked on a clerk at

a residential hotel that barred pets, and Miss Lorraine has been using it ever since to take her dog through subways, past customs officers, on railroad coaches, and into other places where canine companions are not welcomed. To heighten the illusion, Jigg's mistress selects costumes in shades of brown that blend with her dog's coloring, and then attaches a "pinned" flower corsage to the dog's fur by means of an elastic band around his belly. The animal then promptly relaxes every muscle so that he can be draped gracefully around his owner's neck, like a fox, mink, or marten skin. For periods up to one hour at a stretch, Jiggs will hardly bat an eye, his only movement being an occasional tail wag, which his mistress covers up with a nonchalant stroke of her hand.





## Streamline Yacht Resembles Submarine

STREAMLINE from stem to stern, a powerful motor yacht owned by a British sportsman closely resembles a submarine in external appearance. The rakish craft develops a top speed of about forty-four miles an hour, and

is said to have crossed the English Channel between England and France in less than one hour, despite heavy seas. It is shown above at a dock under the shadow of the Eiffel Tower, famous landmark of Paris.

## Marines Wage Mimic War with Model Arms

WARFARE on a small scale is practiced with model weapons on miniature battlefields set up at the U. S. Marine Base at San Diego, Calif. Various problems in battle tactics and general strategy are worked out by the leathernecks with the tiny airplanes, hangars, trucks, cannon, and other accessories of modern warfare shown at the right.

## Skin "Maps" Aid Identification

"MAPPING" pore patterns of the human skin may supplement fingerprinting under a new identification process. A blue dye is applied electrically to the skin and wiped off. A microscope then reveals blue dots in the sweat-gland pores in patterns that are different for every individual.



U. S. Marines study a military problem, aided by model planes and toy tanks



# Air-Raid Shelters Get Realistic Tests



Dummy bomb ready to drop on piled concrete balls. Right, portable shelter after a brick wall fell on it

**N**EW protective measures against air raids, devised by British inventors, recently proved their effectiveness in spectacular tests. Portable, bell-shaped bomb shelters, designed to accommodate three to four persons apiece, were not even dented when experimenters let a brick wall fall upon them. In wartime these shelters would be used to protect key men in charge of military and civilian activities. How

loss of life can be avoided by preventing high-explosive bombs from penetrating the roofs of buildings or dugouts was shown by piling a pyramid of heavy concrete balls upon a model. Under the impact of a test bomb, the spheres were smashed and tossed in all directions, but the structure beneath them remained undamaged. Mass production of the concrete balls is planned, for emergency use.

## Hand Pump Propels Silent "Rowboat"

A NEW "rowboat" for sportsmen, introduced abroad, is propelled by pushing and pulling a handle instead of by swinging oars. Silent gears transmit the power to a small screw propeller, eliminating even the creak of rowlocks and enabling an angler or hunter to stalk his quarry without giving warning of his approach. To steer the boat, a rudder is operated with a pair of foot pedals, through a mechanism resembling the rudder-bar control of an airplane. A speed of twelve miles an hour is said to be possible.



Pumping the handle turns a propeller to drive this new boat for sportsmen. The craft is steered by means of foot pedals



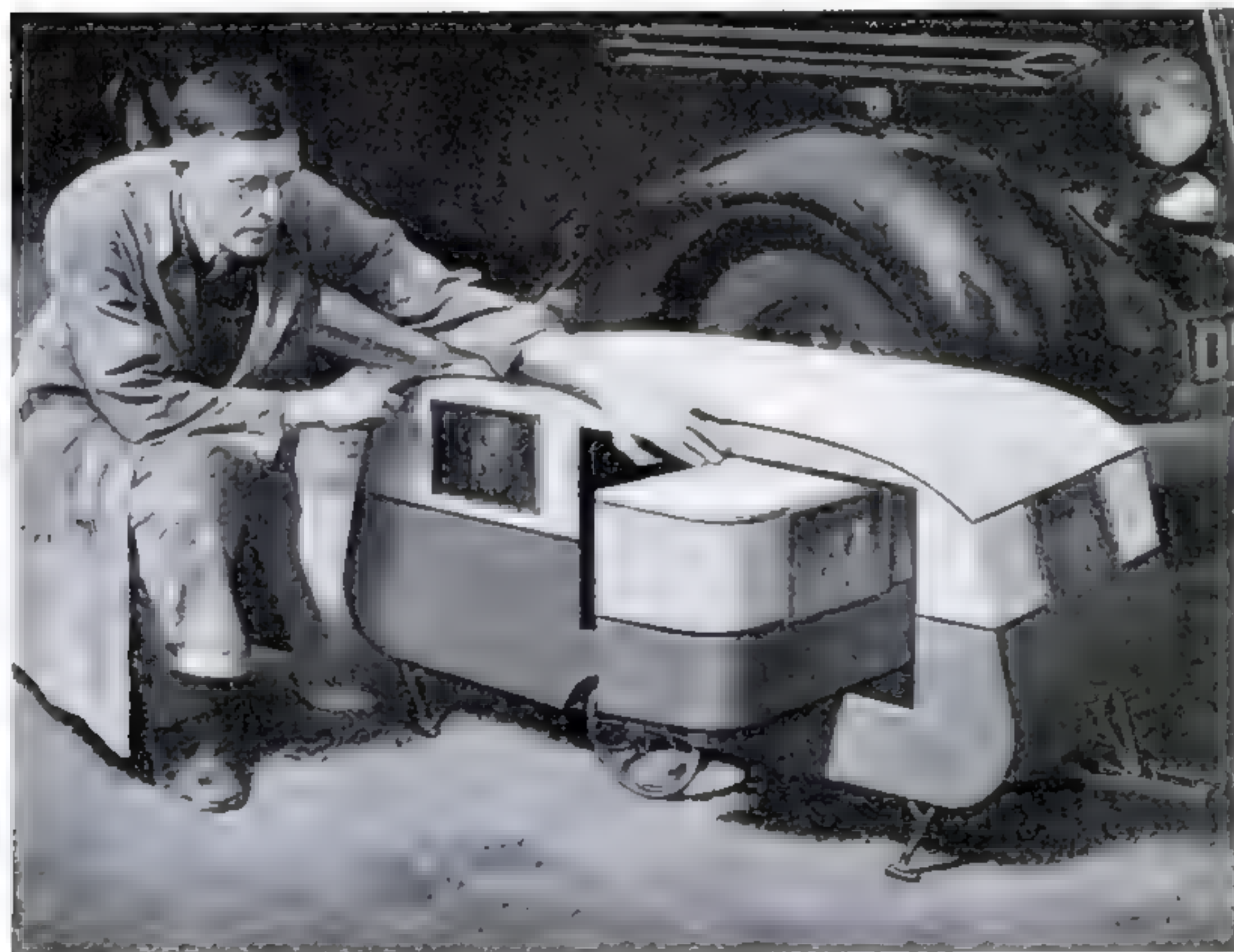


## Cape, Stick, Vanity in Beach Umbrella

The umbrella as a parasol. At right, the cover is being worn as a cape. The inset shows use of make-up kit in the handle cap

**B**ESIDES shielding its user from the sun, a versatile new beach umbrella can be used as a walking stick, a vanity case, or part of a bathing costume. The detachable fabric top may be worn over a bathing suit as a cape, or will serve as a skirt. The rest of the umbrella

folds within a lightweight metal tube, forming a staff to aid in walking over the sand. Flipping open the lid of an oblong cap, at the end where the umbrella ribs converge, reveals a small mirror and make-up in handy form to be applied after a dip.



## New Trailer Has Porch for Sleeping

**HOT-WEATHER** comfort is assured travelers in a new type of automobile trailer, designed by an inventor in Birmingham, England. Pivoted joints enable one side of the body to be swung open at night, providing a sleeping porch exposed to cooling breezes and high above the ground. The illustration at left shows the inventor with a working model of the novel trailer that he has built to demonstrate his idea.

Model of new trailer. The side swings out, as shown, to form a sleeping porch

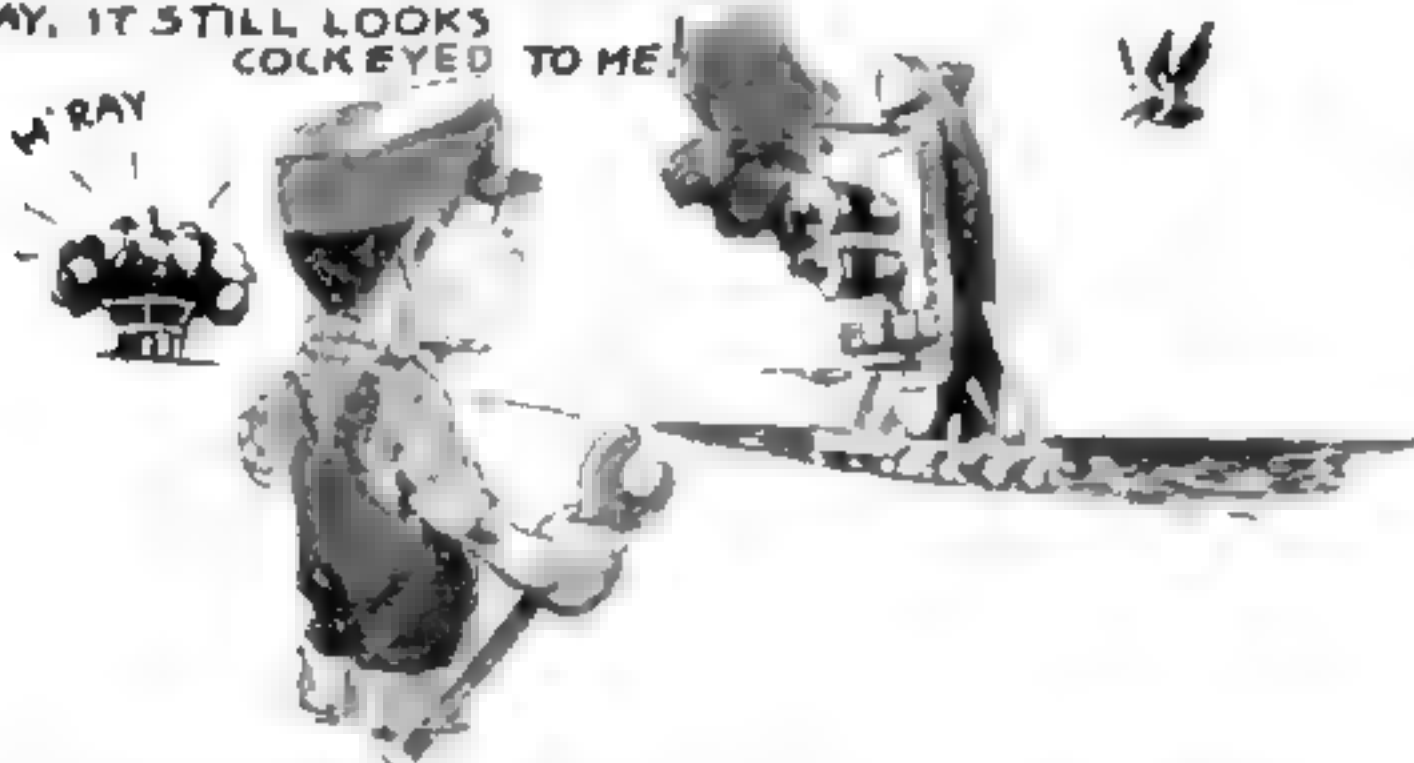


# POPULAR SCIENCE *Question Bee*

Here's an entertaining way to test your knowledge of science and mechanics. Try to find the correct statement in each of the paragraphs below. Check your results against the list on page 228

NO MATTER WHAT THE BLUEPRINTS SAY, IT STILL LOOKS COLKEYED TO ME!

W. RAY



**1** To distribute strains on the hull most favorably, a big ship usually is launched (a) frontward (b) backward (c) sideward (d) upside down.

**2** Polaris is (a) a legendary sunken continent (b) the site of a proposed military air base (c) a radioactive element (d) the North Star.

**3** A magnetic compass surrounded by a coil of electric wire forms a simple type of (a) galvanometer (b) rectifier (c) circuit breaker (d) choke coil.

**4** "Deliquescent" is a term applied to (a) minors who get into trouble with the law (b) chemicals that absorb moisture from the air (c) seed pods that split open lengthwise (d) animals that live at the bottom of the sea (e) a store that sells prepared foods.

**5** The Antarctic would be a likely place to see (a) polar bears (b) reindeer (c) marmosets (d) penguins (e) crocodiles (f) Eskimos.

**6** When heat expands a sheet of metal with a small hole in the center, the hole (a) disappears (b) enlarges (c) remains the same size.

**7** A catamaran is (a) a device for launching airplanes (b) a mountain lion (c) a twin-hulled boat (d) an underground depository for human bones.

**8** Superchargers are (a) wartime profiteers (b) devices to feed air under pressure to gasoline motors (c) boosters to give storage batteries more than their rated voltage.

**9** A straight line touching a circle at only one point, no matter how far it is extended, is called a (a) chord (b) tangent (c) sector (d) cosine (e) rhumb line.

**10** Pegmatite dikes interest (a) anatomists (b) flood-control engineers (c) geologists (d) plumbers (e) astronomers.

**11** A skiagraph (a) tests the resiliency of skis (b) shows what your insides look like (c) transmits signals by sunlight.

**12** Retractable landing gear is a feature of modern (a) ocean liners (b) elevators (c) airplanes (d) deep-sea fishing tackle.

**13** Horology deals with (a) casting horoscopes (b) raising vegetables and flowers (c) making clocks (d) pitching horseshoes (e) the study of hormones.

**14** The cochlea is a member of (a) the crew of an eight-oared racing shell (b) the vegetable kingdom (c) the British Privy Council (d) the ear.

**15** When its vapor pressure reaches the atmospheric pressure, a liquid (a) freezes (b) boils (c) sublimates (d) ferments.

**16** A pawl is (a) a tool for piercing small holes in wood or leather (b) a kind of sailboat (c) a device to keep a ratchet wheel from turning backward.

**17** You will find isobars (a) in shallow rivers (b) around ships' compasses (c) on weather maps (d) in taverns (e) at candy counters.

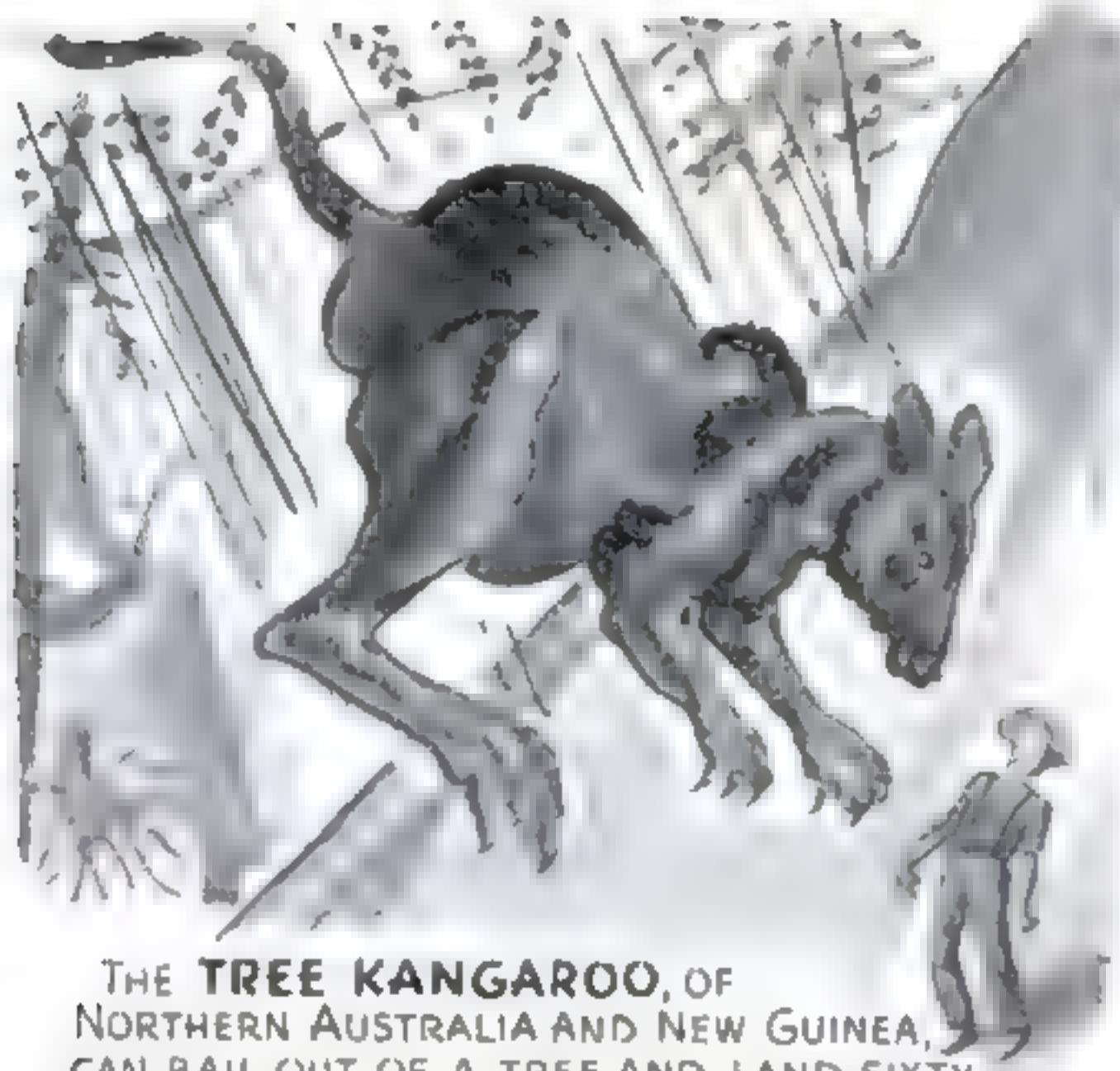
**18** If you lost some radium in a building, you could locate it with (a) a dip needle (b) an electroscope (c) a radiometer (d) a fluxing rod.

**19** Silkworms eat (a) flies (b) the nectar of poppy flowers (c) woolen clothing (d) mulberry leaves (e) young bamboo shoots.

**20** An important type of radio receiver is called the (a) anodyne (b) superheterodyne (c) radiolarian (d) Marconi rig (e) Cliveden set.



# Un-Natural History *By Gus Mager*



THE **TREE KANGAROO**, OF NORTHERN AUSTRALIA AND NEW GUINEA, CAN BAIL OUT OF A TREE AND LAND SIXTY OR MORE FEET BELOW, WITHOUT CRACKING UP!



**COWBIRDS** LAY EGGS IN THE NESTS OF SMALLER BIRDS, WHICH HATCH AND FEED THE YOUNG! BECAUSE OF ITS SIZE, THE COWBIRD FLEDGLING CROWDS OUT ITS FOSTER BROTHERS AND SISTERS AND TAKES ALL THE ATTENTION OF THE MOTHER BIRD!



FRAIL **ANGEL-WING SHELLS** ARE OFTEN FOUND BURIED ALIVE IN GREAT ROCKS! WHEN YOUNG, THE CREATURES BORE THEIR WAY FAR IN, AND AS THEY GROW THEY KEEP THEIR SHELLS GRINDING TO MAKE MORE ROOM! THE THROAT TUBE STRETCHES OUT THROUGH THE HOLE FOR FOOD!



WE THOUGHT THE FIVE-FOOT VENEZUELAN EARTHWORMS WERE TOPS, BUT A READER WRITES IN TO SAY THAT **AUSTRALIAN EARTHWORMS** GROW TO A LENGTH OF TEN FEET, AND AS THICK AS A GARDEN HOSE! THAT'S BAIT FOR A WHALE!



FISHERMEN IN CHINA AND JAPAN TRAIN **CORMORANTS** TO CATCH FISH FOR THEM! A RING OR STRAP AROUND THE BIRD'S NECK KEEPS IT FROM SWALLOWING THE FISH, WHICH IS RECOVERED FROM ITS GULLET!



ALTHOUGH A FIRST COUSIN OF THE GARDEN PEA, THE **PEANUT** DIFFERS FROM OTHER MEMBERS OF THE PEA FAMILY BY SENDING ITS POD-BEARING STEMS DOWNWARD INTO THE GROUND FOR THE PODS TO RIPEN, WHILE ALL OTHER PEAS BEAR THEIR PODS IN THE AIR AND SUNLIGHT!



# Handy Helps

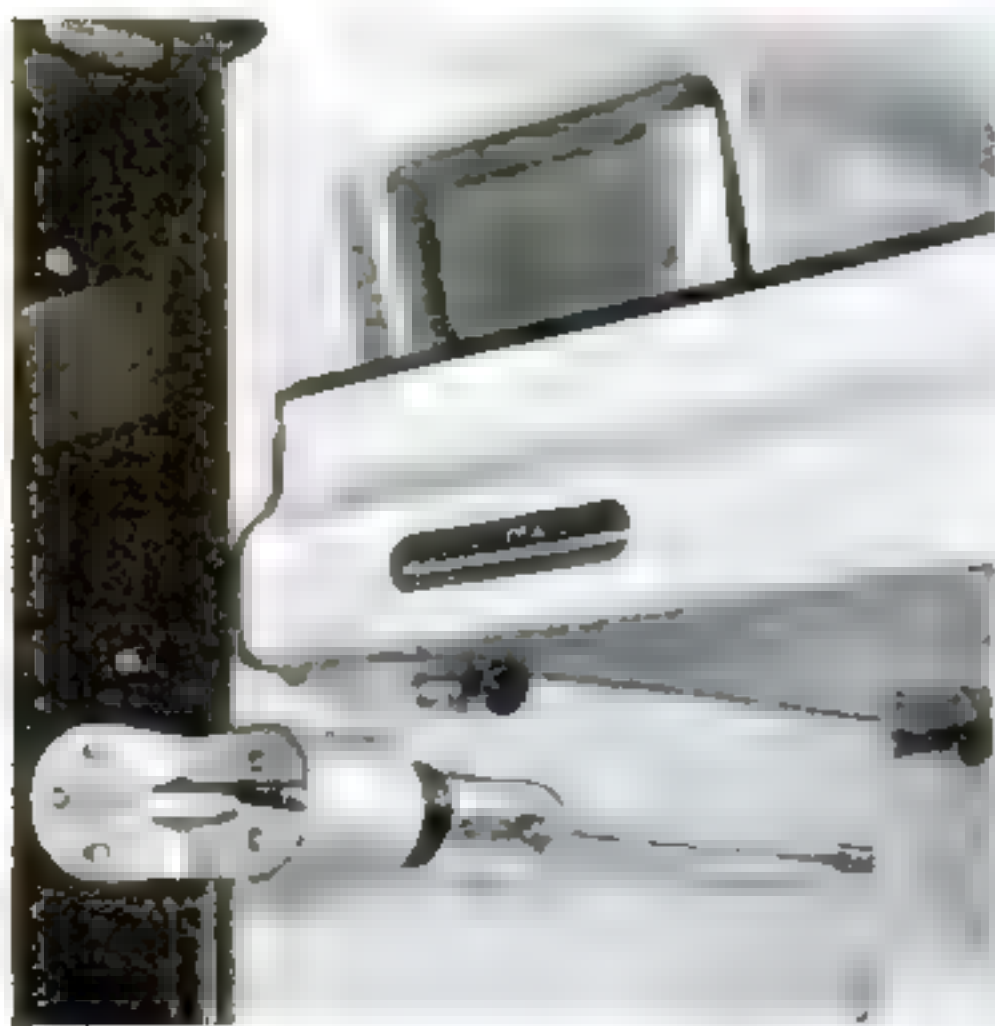


**CURTAIN CLIPS.** Shaped and colored to resemble butterflies, these spring-operated clips are handy for ornamenting tie-backs and for pinning up curtains. To attach a clip, the two wings are pressed together

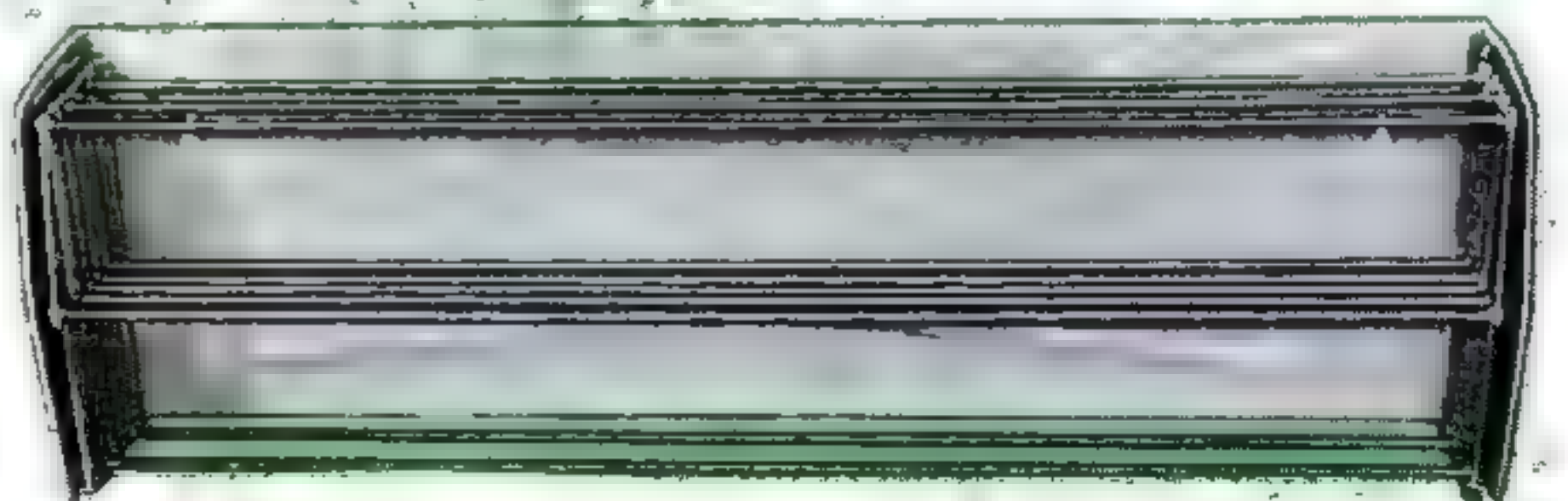


**JAR SEALER.** Fruit jars are sealed tightly with the aid of a new device. A wheel operated by a thumb lever is used to press down the edge of the cap

**FOLDING DRIER.** Drying space equal to fifteen feet of line is afforded by the compact rack below. It folds back into small space, as in the lower view



**TUBE LAMP STERILIZES AIR IN REFRIGERATOR.** Installed in a refrigerator food compartment, the tube lamp seen above emits ultra-violet rays that are said to sterilize the circulating air and aid in preserving food. Using a built-in transformer, the unit operates only when the refrigerator mechanism is running and the door closed





# for Homemakers



## KITCHEN TABLE HOUSES WASHER

Built into a standard-size kitchen table, a new electric clothes washer saves space. The detachable wringer stows away in the rinse tub, as shown below, when not in use.



## A SAFETY VALVE FOR PIES

Steam formed in the filling of a pie during baking escapes harmlessly through this funnel-shaped device, which leads it to a small hole punched in the upper crust.



**PICNIC ICER.** Picnic perishables are kept cold and fresh by a can containing a special liquid which is frozen in advance in the refrigerator. The compound is said to remain frozen twice as long as a piece of ice the same size, and can be used again.



## CLEANSING SHOT IN CHAIN FORM

Steel shot strung together into a chain now make it possible to enjoy the advantages of using shot to clean and scour small-necked bottles and kitchenware, without the usual inconvenience. In the new form, the shot is not hard to handle.







"Here's half your trouble," said Gus Wilson. "Some one put an ordinary single-contact bulb into that double-contact socket."

## GUS SPOTS SOME Tail-Light Troubles

**H**E WAS a dried-up-looking little fellow who didn't stand over five feet four, but when he hopped out of an almost-new sedan outside the shop door of the Model Garage, one sunny spring morning, Gus Wilson saw that he was nursing a man-size grouch.

"Name's Barnstable!" he snapped, pulling off an old hat and running his bony fingers through his sparse gray hair. "Maybe you've heard tell of me."

Gus nodded. He had heard tell of Silas Barnstable, who, in boom days, cut up his farm into building lots, sold them for spot cash, and had been living on his money ever since—in an apartment house.

"Well, if you've heard tell of me, chances are you've heard I'm a grouch," Barnstable went on. "I'm not! But it makes me good and sore to be skinned. Just because a man is foresighted enough to have a few dollars laid away is no—What I mean is that when I pay for anything I want to get what I pay for, and when I don't get it I raise the devil! Understand, mister?"

"Sure, I understand," Gus told him. "But what's bothering you—we haven't skinned you, have we?"

"You haven't—yet," Barnstable admitted

grudgingly. "Maybe you will, though—every other garage around here has!"

Gus started to get mad, and then grinned instead. "What's bothering you?" he asked again.

Barnstable jerked a thumb at his sedan. "That's what's bothering me!" he yelled. "That dam' automobile! It's got the very devil in it! I've had it in every garage around here, and all they've done is take my money. Not a one of them has been able to find out what's the matter with it, let alone fix it, but they've all charged me plenty. Not a one of those fakes knows his business! Some one told me that you do. All right, mister. Go right ahead and prove it! You can't get my car fixed by standing there grinning at me!"

"Just for a starter," Gus suggested patiently, "suppose you take time out to tell me what's the matter with your car!"

"Matter with it!" Barnstable got redder in the face. "The matter is that every time I step on the brake the dash light goes on! And that ain't the worst of it—not near the worst of it! Every time I pull the hand brake on, the horn honks! Makes a danged fool out of me!"

Gus had to laugh. "I'll see what I can do about it," he promised. "You come back about noon and—"

"Come back nothing!" the little fellow snarled. "I'm going to stay right here and make sure you do something for what you charge me. I've been stung often enough!"

"Suit yourself," Gus said tolerantly. "After all, it's your time you'll be wasting. Drive her in, will you?"

While Barnstable was driving her in, Gus went over to his workbench. He heard the loud toot of a horn behind him, and turned in time to see his irate customer climbing out of his car. "She honked again!" he shouted. "It's driving me crazy!"

Under Barnstable's angry and suspicious eye Gus went over the wiring thoroughly. Everything seemed all right, except that every time he pressed down on the brake pedal, the dash light flashed on and stayed on until he released the pressure. But, although he pulled on the emergency brake several times, he failed to produce one of



## BY MARTIN BUNN

the horn honks that had so enraged Barnstable.

Gus thought things over while he loaded a pipe. "Well, ain't you going to do anything about it?" demanded the little man.

Gus grinned at him without replying, lighted his pipe, went around to the back of the car, took out the tail-light lamp, and examined it for a few seconds.

"Here's half your trouble, anyhow," he said. "Some one has put a single-contact bulb into that double-contact socket. As a result, the current back-tracks and lights your dash lamp whenever the stop-light circuit is closed by the foot brake being applied. It will be all right as soon as I've put in a lamp of the right type."

He substituted a double-contact bulb. "Try her now," he said. Barnstable got into the car and stepped on the brake pedal. The dash light didn't flash on.

"Guess you managed to fix that part of it," he admitted grudgingly. "But how about that danged horn-honking?"

"Pull your emergency brake on again," Gus told him. He watched intently. The little man was so short that he had to twist his body around and reach wide to get hold of the emergency-brake lever. But he pulled

it on with an emphatic jerk, just the same. *Honk!*

"What did I tell you!" Barnstable yapped. "You ain't helped it a bit. Bad as ever! You automobile fellows are all alike. I swear I'll—"

Gus was laughing. "Take it easy!" he advised. "Don't you see what happens every time you pull on that hand brake? You're a little bit—quite a little bit—shorter than the average driver. When you reach over to get hold of that brake lever, you have to twist and stretch your body around so far that the front of your left shoulder comes down on the horn ring and blows the horn!"

It took him ten minutes of patient argument and demonstration to convince Barnstable that it was his own contortions that caused the horn-tooting whenever he put on his emergency brake. At last, the little man gave in with a sour smile. "Well, how much do I owe you? You ain't done much!" was all he said.

"You owe me just for the new tail-light bulb," Gus told him. "Whenever I get a good laugh out of a job. I take something off the bill!"

"That's reasonable," Barnstable conceded. "Yes, sir, I call that fair." He handed over the money and got into his car. I'll send you some business, if I get a chance, maybe."

"'Maybe' is right," Gus chuckled to himself



"Every time I pull the hand brake on, the horn honks," snarled Barnstable. "Makes a danged fool out of me."



as the customer drove away. "That old codger couldn't say a good word for anybody."

Several days later, however, as Gus and his partner, Joe Clark, were getting ready to close up for the night, Gus's doubts about the old codger were given a setback.

"Sorry to bother you so late," came a voice at the office door as a young man who had driven his car up in front of the garage stepped in unexpectedly. "Old geezer named Barnstable—lives in my apartment—sent me here. Said you could fix my car if anyone could."

"Barnstable!" exploded Gus, in amazement. "He said that? Well I'll be . . . !" Gus's face broke into a broad grin.

"The shop's really closed," he said, "but we're always glad to oblige. I'm Gus Wilson. What seems to be the trouble?"

"I'll have to do a little explaining," the newcomer said, and Joe motioned him to a chair. "My name's Hubbard. I'm a salesman, and I travel this part of the state in my car. As I have to be on my way pretty early most mornings, and there's no garage at all handy to the Hillcrest Court Apartment, where I live, I park the car at night on the street at the side of the apartment house. Probably you know it. It has a pretty steep grade, and even late at night there's quite a lot of traffic on it. That means I have to pull my hand brake on hard, and leave my cowl and tail lights burning all night.

"This evening I took my wife to the movies. When we got home about an hour ago, I let her out at the main entrance, and then drove around to the side street and parked my car as usual. But when I turned off the ignition switch, the engine kept right on running!

"I've been driving long enough to know a little something about cars, and I fussed around for quite a while trying to find a way of turning off that engine. Before I got through I found two ways of stopping it—but neither of them was any good to me.

"If I left the lights on and released the hand brake, the engine would stop. But the grade is so steep on that side street that I didn't dare just put the car in gear and, without the hand brake on, trust that it wouldn't start rolling.

"I also found that the engine stopped when I turned the lights off. But parking a car all night without lights in this town means

a sure ticket in the morning, and a half day wasted in court and, probably, a five-dollar fine. Anyhow, I figured that there must be a short circuit somewhere in the wiring and that, if I left the car stand overnight without getting it fixed, I'd be sure to run down the battery.

"While I was wondering what the deuce to do about it, old Barnstable came along, asked some fool questions, and then told me about your garage. So here I am. Think that you can help me out?"

"We can try, anyhow," Gus said. He walked over to the window, looked out, and with a glance identified the make and model of Hubbard's car. Then he strolled back to his chair, sat down, and began puffing at his pipe. Gus carries around in his head a set of mental diagrams of the wiring systems of all the cars that are built in Amer-

ica, and sometimes it takes him as much as a minute to sort out the one he wants. Hubbard stared at him, but, before he could ask a question, Gus began to make his diagnosis.

"On your car," he said, "and on lots of other cars, the hand brake operates the stop-light switch. The stop-light circuit is connected to the battery at the ignition switch—the wire to the coil and the wire to the stop-light switch are fastened to the same post on the back of the ignition switch. The reason that your engine continues to run after you've turned off the ignition, while your hand brake is on and your lights are burning, must be that current is feeding into the ignition system through the lighting system. The stop-light switch must have something to do with the trouble, because it's operated by the hand brake.

"Let's see now—your combination tail and stop light has a two-filament lamp, and your stop-light switch connects the lighting circuit to the ignition coil. So, Mr. Hubbard, your mysterious trouble must be in the tail-light lamp."

"Ignition trouble in a tail lamp! That's a new one on me!" said Joe Clark. Hubbard was beginning to look as if he felt decidedly doubtful that he had come to the right place.

"Trouble is where you find it," Gus said placidly. "I'll tell you what must be happening. The lighting current must be traveling through the filament of the tail-light bulb, through the filament of the stop-light bulb, through the stop- (Continued on page 232)

## GUS SAYS:

Summer's coming, and that's no time to drive your car with winter oil and a lot of sludge and grime in your crankcase. Before real hot weather hits you, get your motor drained, flushed, and refilled with the proper lubricant. Oil is cheap compared to bearings.



# The Home Workshop



*In This Issue*

**BUILDING SURFBOARDS • RADIO • MODELS  
PHOTO RANGE FINDER • ERROR-SPOTTING CONTEST**



# Can You Spot These

Drawings from which the smoking stand was built. The errors are not here, but in the nine photos

## A NEW CASH

**H**OW good are you at detecting the mistakes commonly made by inexperienced woodworkers? Here's a chance to find out and perhaps win a cash prize. All you have to do is to study the accompanying nine photographs and list all the errors you notice. For the most complete, accurate, logically arranged, and clearly but briefly worded answers received on or before July 1, 1939, POPULAR SCIENCE MONTHLY will award eight prizes as follows:

|                       |      |
|-----------------------|------|
| FIRST PRIZE           | \$25 |
| SECOND PRIZE          | 15   |
| THIRD PRIZE           | 5    |
| FIVE PRIZES, \$1 each | 5    |

The contest is based upon a smoking stand of hard maple. Drawings for this were prepared by Frank Hegemeyer, a craftsman

**2** Possibly you didn't find anything to criticize in photograph No. 1, but you may see something wrong here. The operation is, obviously, that of ripping a board up to make the turning squares for the spindles



**3** Eager to get to work on his new lathe, Mr. Hegemeyer's enthusiastic friend has mounted one of the turning squares between centers. Everything is all set and, chisel in hand, he is just about to throw the switch. Any errors in this?





# Woodworking Mistakes?

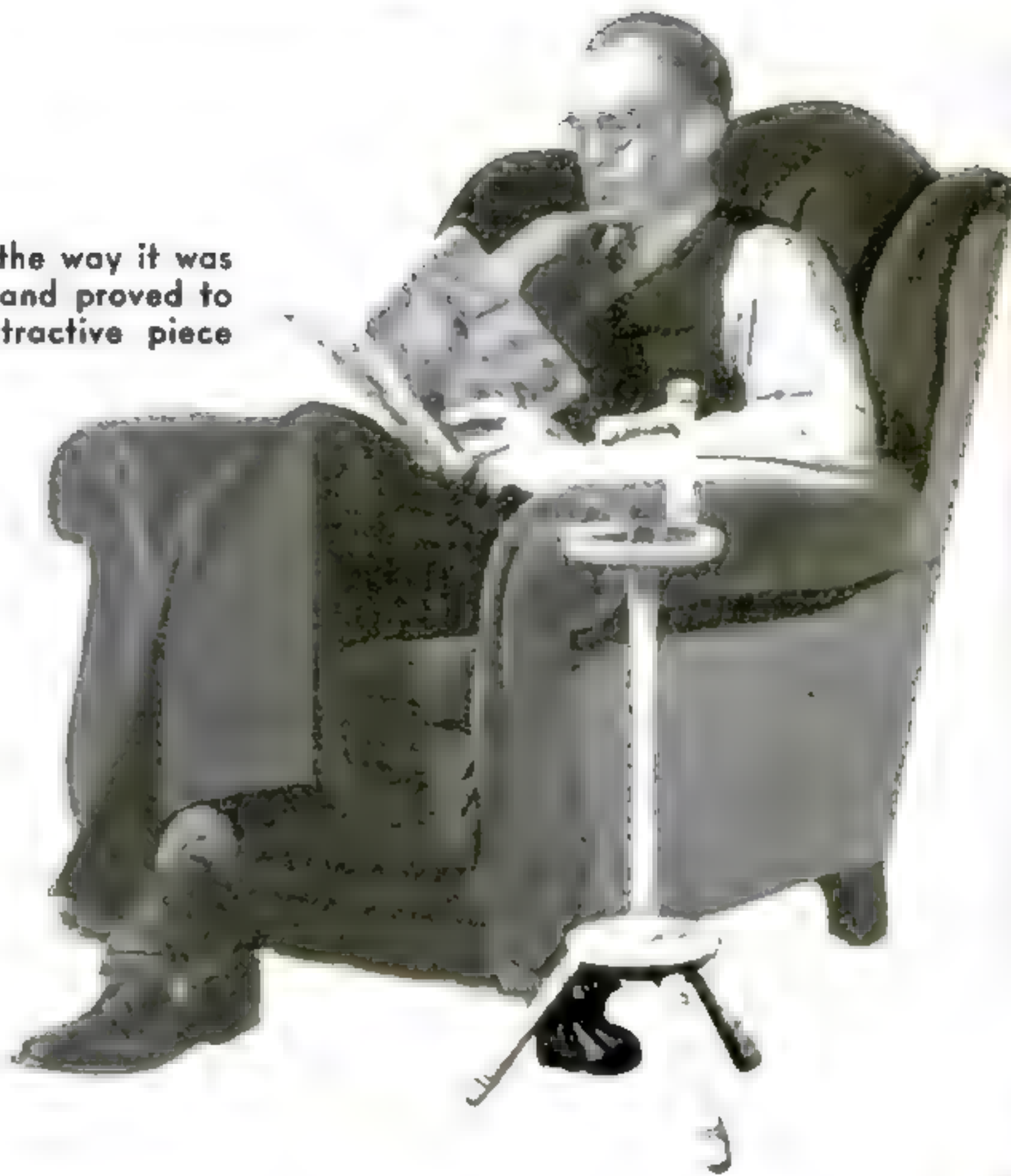
## PRIZE CONTEST

who contributes regularly to this magazine. The design is of the Early American type, not at all difficult to construct. Since the piece is made almost entirely on the lathe, it is one to appeal particularly to the owner of a new set of woodworking tools, who usually wishes to try out the lathe first.

Mr. Hegemeyer happens to have a friend who has just taken up the home workshop hobby and owns an excellent set of woodworking machines, so he gave him the drawings and suggested that he try to build the smoking stand. Attached to the drawings was a typewritten sheet with the following additional instructions.

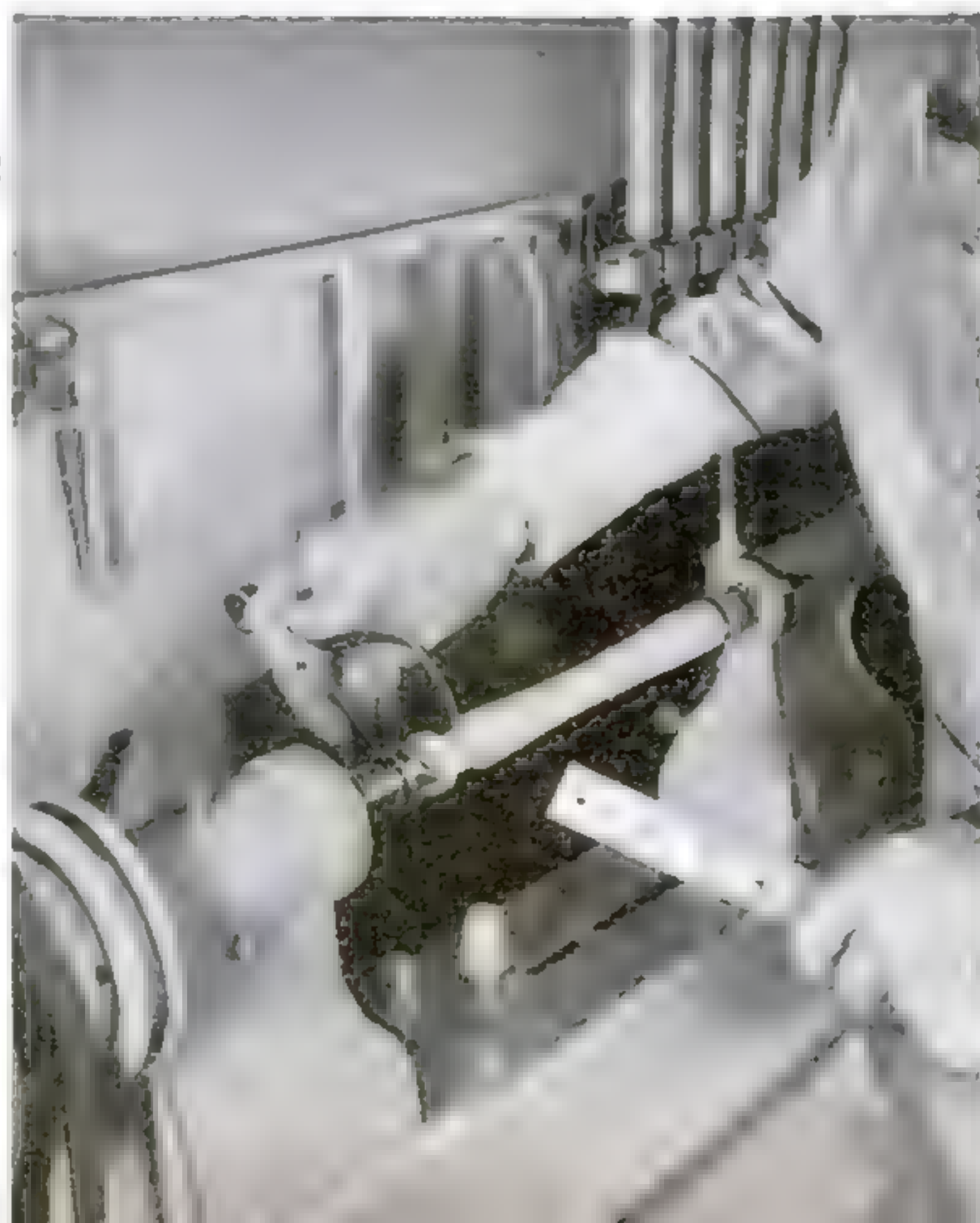
"Cut all turning squares  $1\frac{1}{8}$ " thick for the spindle turnings. All spindle turnings should be 1" in diameter and tapered to  $\frac{3}{4}$ " in the center. Drill a  $\frac{5}{8}$ " deep hole in the upright of

1 In spite of the way it was built, the stand proved to be quite an attractive piece



4 Now he's got one of the leg turnings nearly finished, but there is the tenon at the end to think about. Is it the right size? Naturally, the way to measure the diameter is with calipers, so here he is checking up on the tenon

5 The spindles are all finished so far as the actual turning is concerned, but they have to be smoothed up. He chose No. 2 garnet cabinet paper, although the grade number hardly shows in the photo





the handle section before turning. The turned tray and base section should be at least  $1\frac{1}{8}$ " thick before doing the faceplate turning. The depth and width of the recess for the tray is optional, but the tray should not be over 4" wide and  $\frac{1}{2}$ " deep."

Mr. Hegemeyer's friend plunged right into the job and turned out a reasonably good smoking stand. Photo No. 1 shows the finished result, and photos Nos. 2 to 9 show various operations in the order he performed them.

Now, just what was done wrong? Make out a list, preferably typewritten, and refer to each photograph by its number. Describe

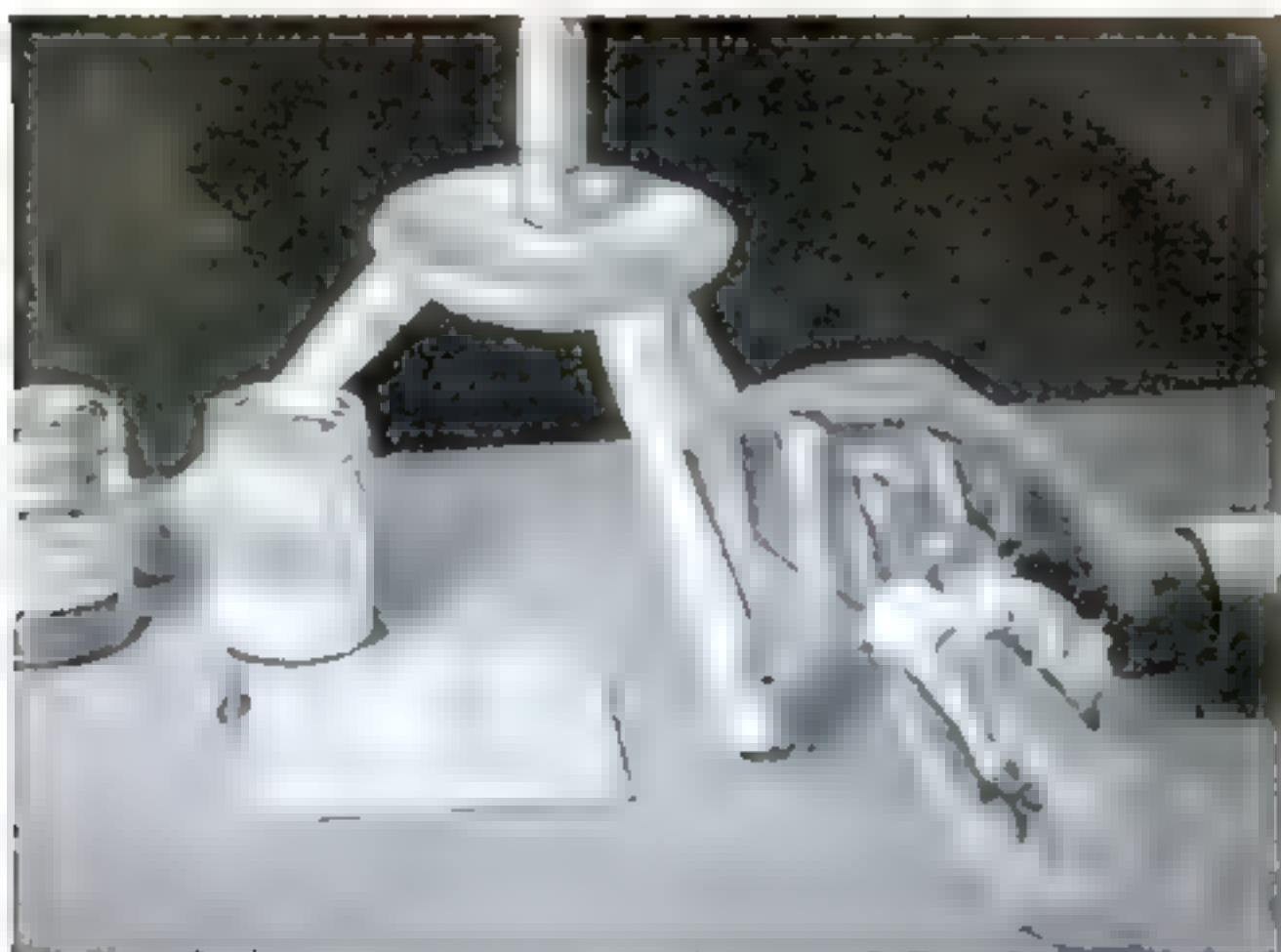
each error separately and be quite definite.

Mail your entry to the Contest Editor, POPULAR SCIENCE MONTHLY, 353 Fourth Avenue, New York, on or before July 1, 1939. No entries will be returned. The judges will be the home workshop and technical editors of this magazine and Herman Hjorth, author of "Machine Woodworking," "Basic Woodworking Processes," and "Principles of Woodworking." The decision of the judges will be final. In case of ties, each tying contestant will be awarded the prize tied for. The contest is open to all except employees of this magazine and their families.



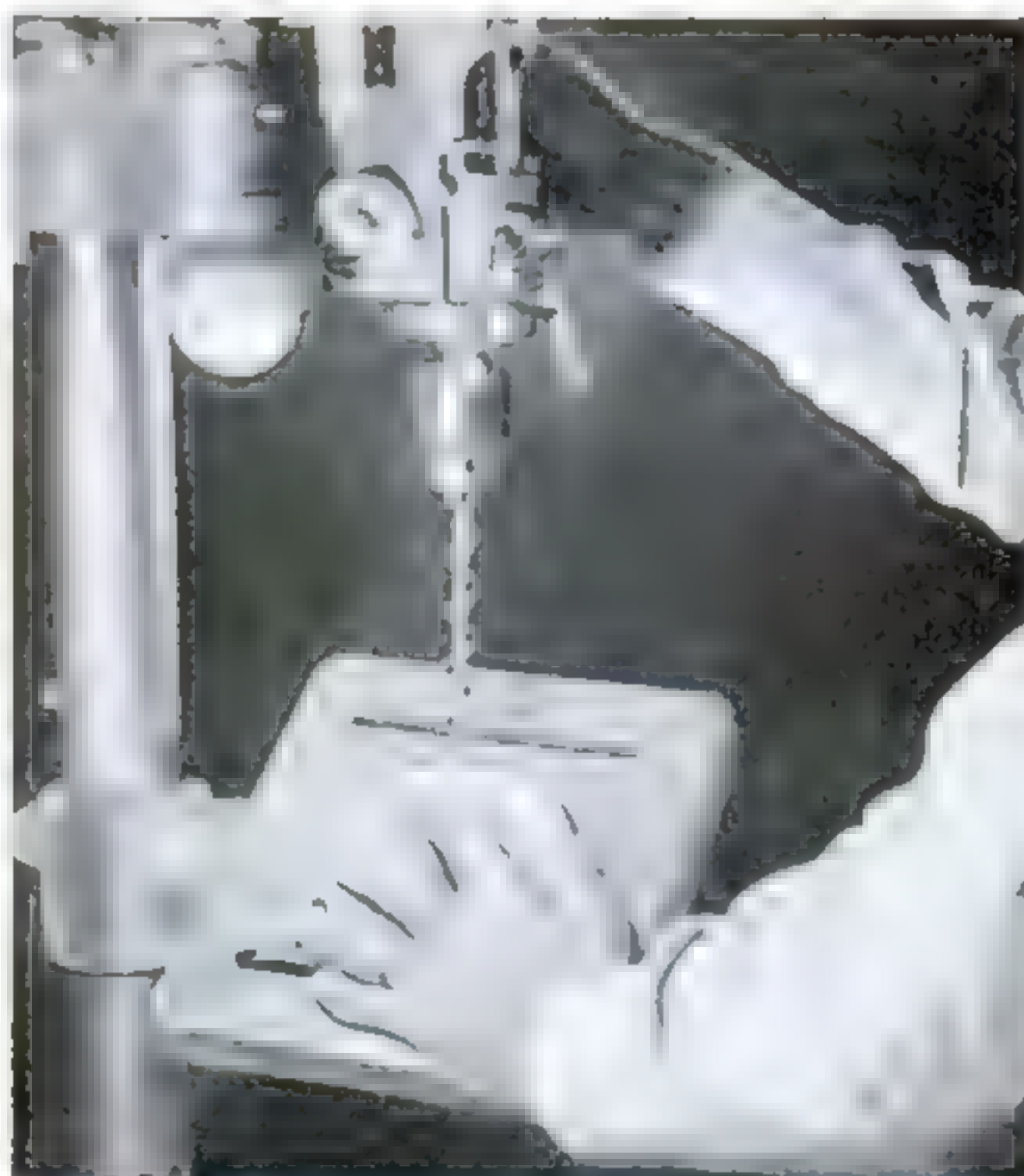
**6** When the spindles were finished, he gave his new band saw its first trial in cutting the stock from which to turn the tray and base

**9** After applying three successive coats of varnish (one each day), he was prepared to give the smoking stand a final rub down as shown below

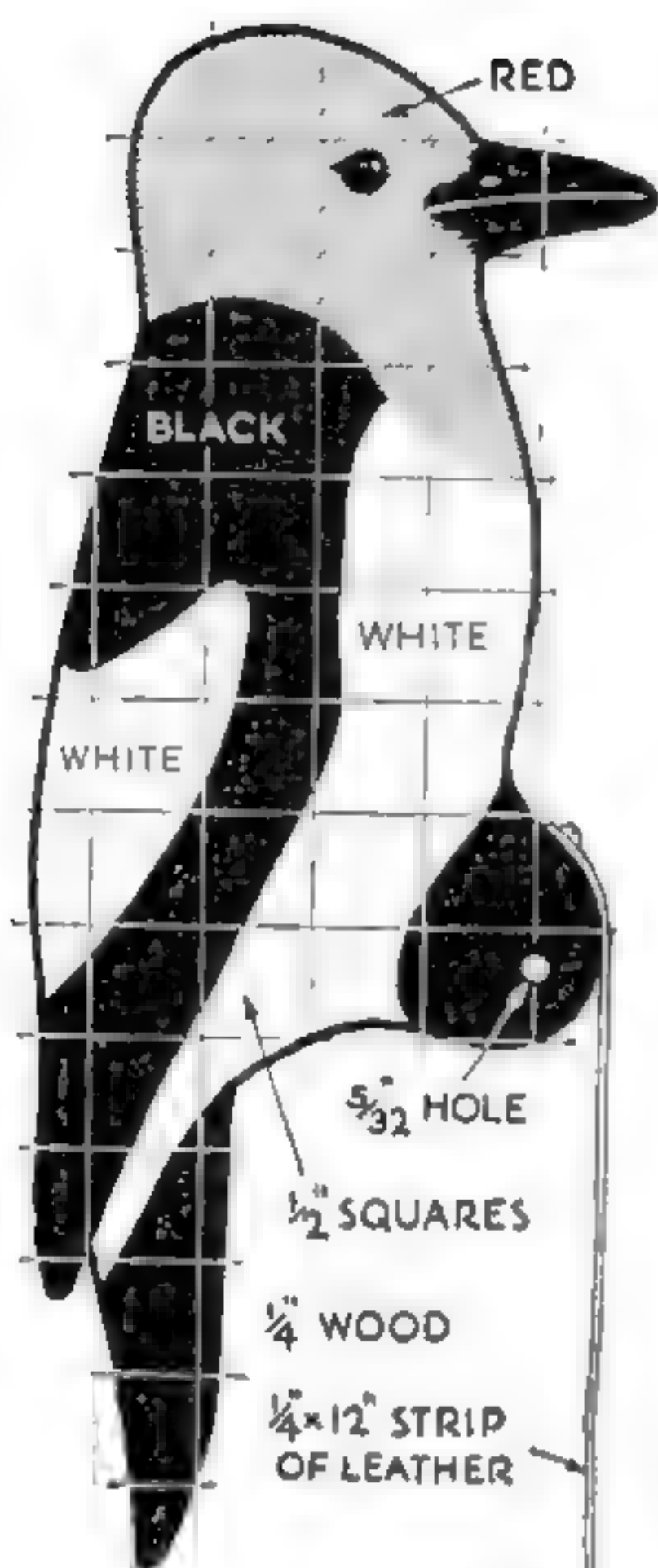


**7** The photograph above shows how he cut out the recess in the top of the stand to hold the ash tray. He planned to buy a suitable tray

**8** After he had turned the base section, he was a little puzzled as to how to bore it for the leg tenons, but finally did it as indicated here

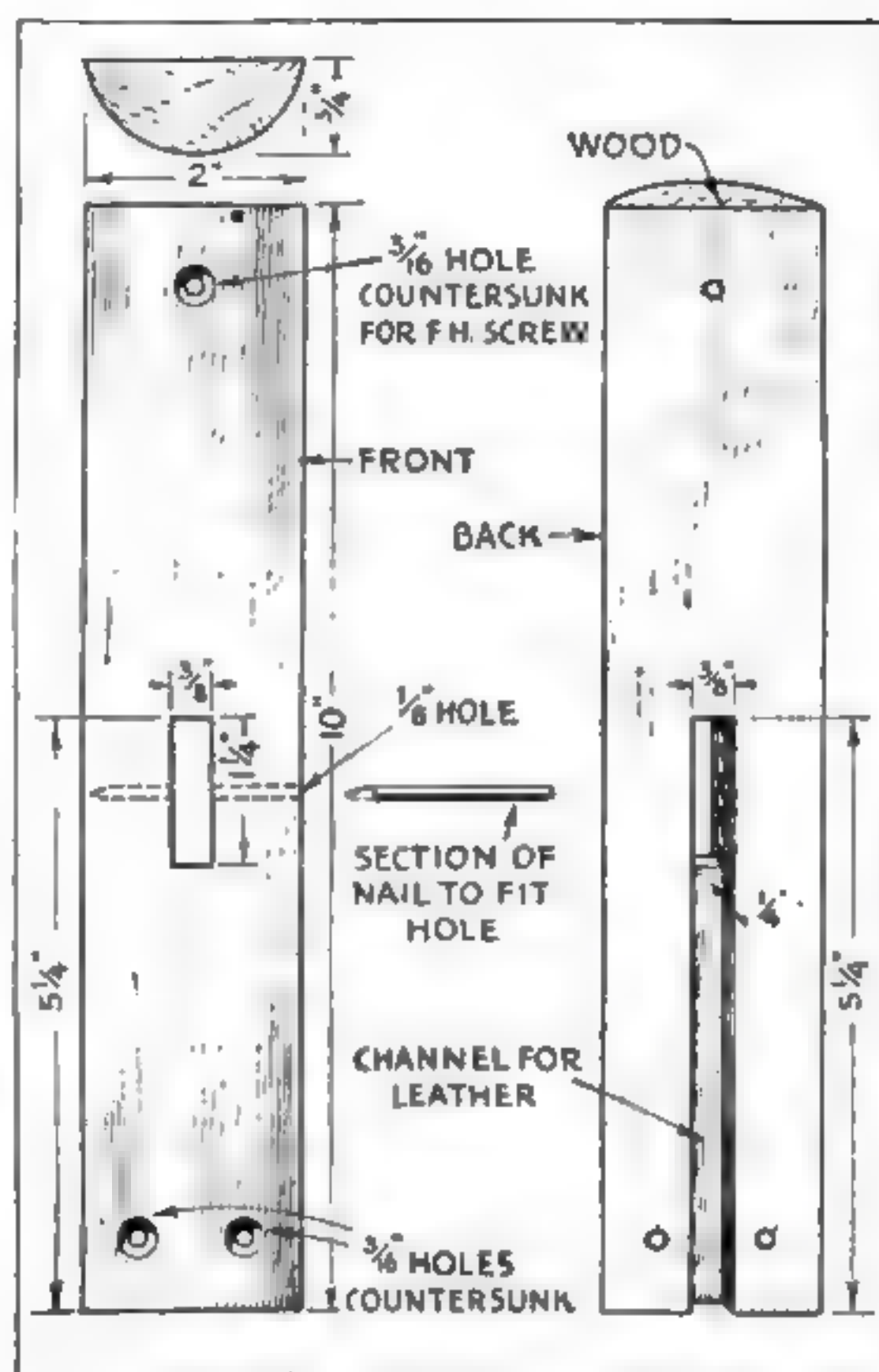






# Woodpecker

## MOUNTED ON DOOR TO ACT AS A KNOCKER



**T**HIS red-headed woodpecker, perched on a cabin or back-yard door, serves as a door knocker when some one pulls the string.

The bird is sawed from a piece of  $\frac{1}{4}$ " wood. The piece of wood to which the bird is attached, after being cut to dimensions, is given a half-round shape, or a section from a tree limb with the bark left on may be used, if preferred, to make this part of the knocker. A channel is cut in the back of the tree-limb piece to accommodate the pull cord, which may be leather or a heavy string. The cord is attached to the concealed part of the bird

with a small roundhead wood screw, and the bird is hinged loosely in the opening with a piece of a nail of the required size. The pull cord is passed down through the channel in the back and knotted at the end.

The woodpecker is painted as indicated, and the limb section is given several coats of clear varnish or lacquer. Three flathead brass wood screws are used in fastening the knocker to the door.—GEORGE A. SMITH.



## Old Thickness Gauge Provides Blades for Palette Knives

**FLEXIBLE** palette knives or spatulas are invaluable not only for artists' use, but also for mixing small quantities of tinting colors and for applying composition wood and other soft fillers or cements to small cracks and holes. Excellent ones can be made without cost from discarded leaves removed from an old, well-tempered thickness or feeler gauge. Select a leaf of the required stiffness and rivet it to an old brush handle. If it is desired to bend the blade to a trowel-like shape, apply heat carefully to the region where the bend is to be made.—S. J. GANCHER.



## Tie-Backs and Window Wedges Jig-Sawed from Thin Wood

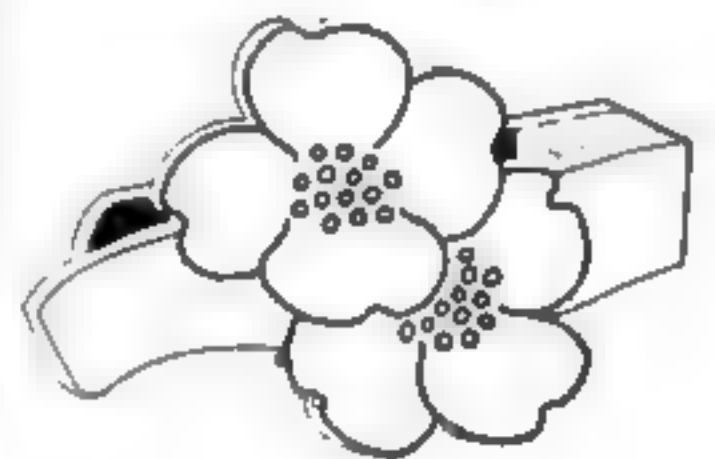
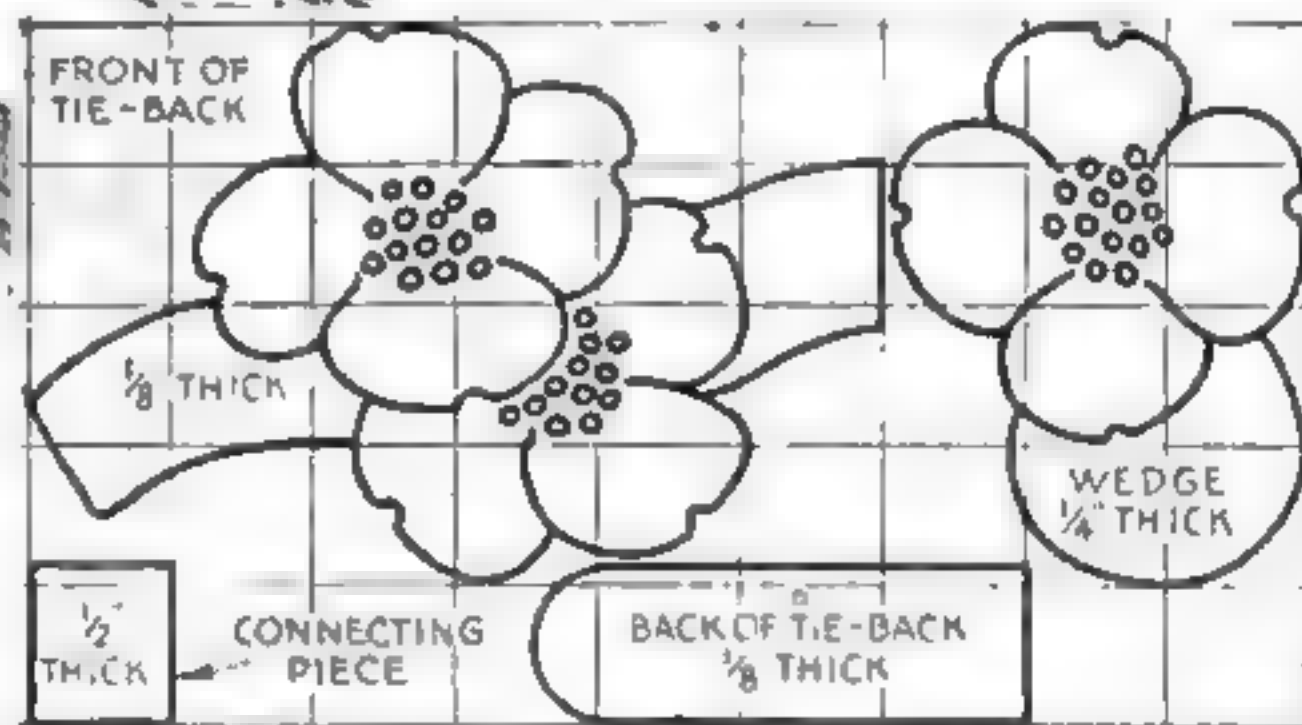


A window set of dogwood-blossom design. Each curtain tie-back is fastened with a small screw driven at a slight angle

**W**HITE dogwood blossoms on a brown branch provide the color scheme for this little set of curtain tie-backs and window wedges. Two tie-backs and one or two wedges are needed for each window of the room in which they are to be used. Cut the front and the back of each tie-back from  $\frac{1}{8}$ " thick hardwood and the small connecting piece from  $\frac{1}{2}$ " material. Glue them securely together and reinforce with thin brads or screws. Cut the wedge from  $\frac{1}{4}$ " wood and trim the rounded end quite thin at its outermost curve.

Enamel the flowers white and the branch whatever shade of brown will harmonize with other colors in the room. Add a small splash of red at the notch of each petal of a flower, and make a large, dull-green center with

scattered dabs from a nearly empty brush. Paint round spots of both yellow and red on the green center.



## Grinding-Wheel Guard Made from Old Brake Drum

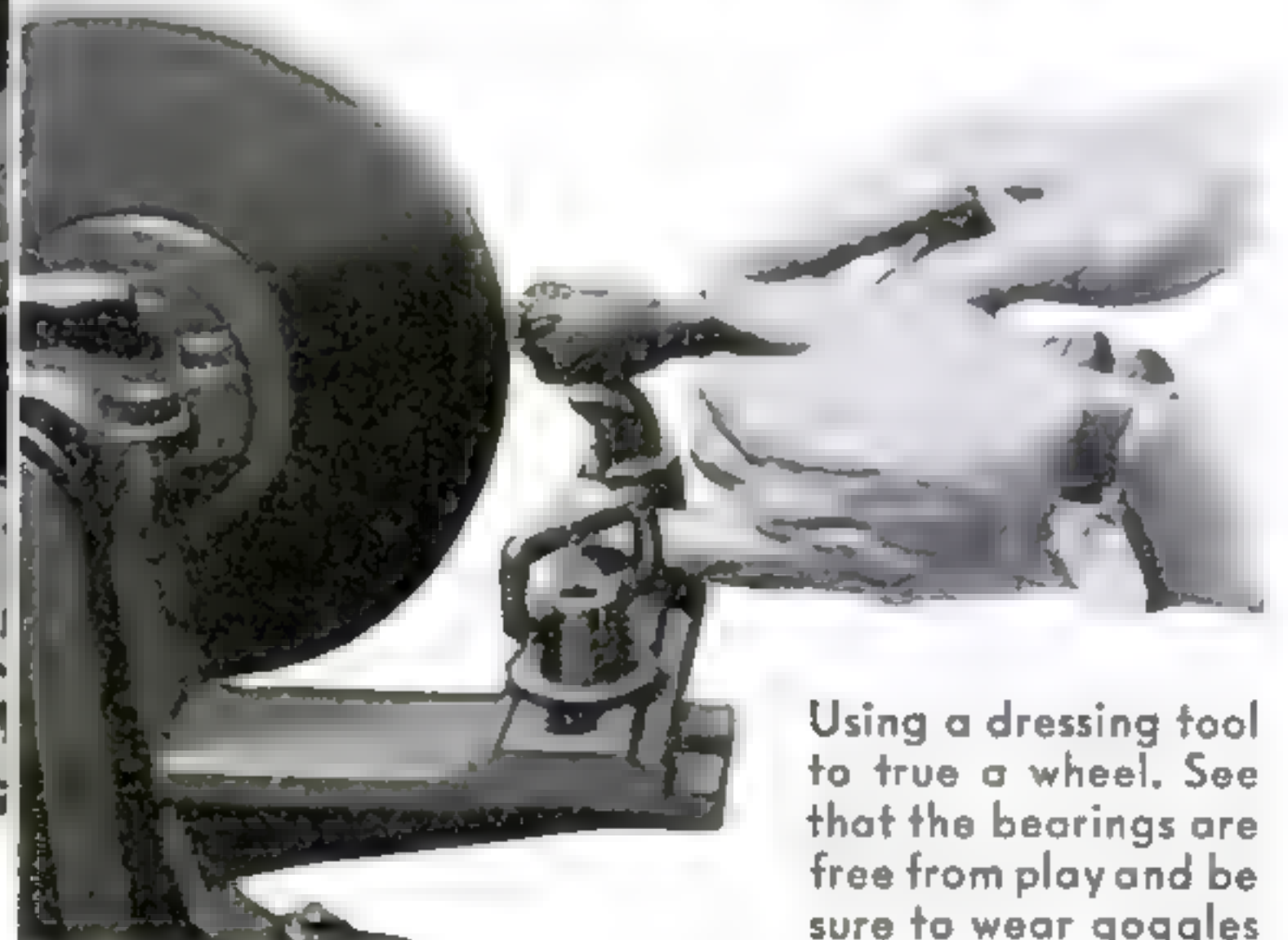
**AN UNGUARDED** grinding wheel can be provided with an effective guard by making use of an automobile brake drum as shown. A sheet-iron cover is added to close in the open side of the drum.

Professional mechanics realize the impor-

tance of keeping a grinding wheel trued up, but this is not always true of amateurs. The wheel-dressing tool should always be used with the grinding rest. The handle is raised until the dressing wheel is revolving against the face of the grinding wheel, and then the dresser is moved slowly back and forth across the face.—W. C.



How an old auto brake drum is used as a grinding wheel guard. Sheet iron covers the open side

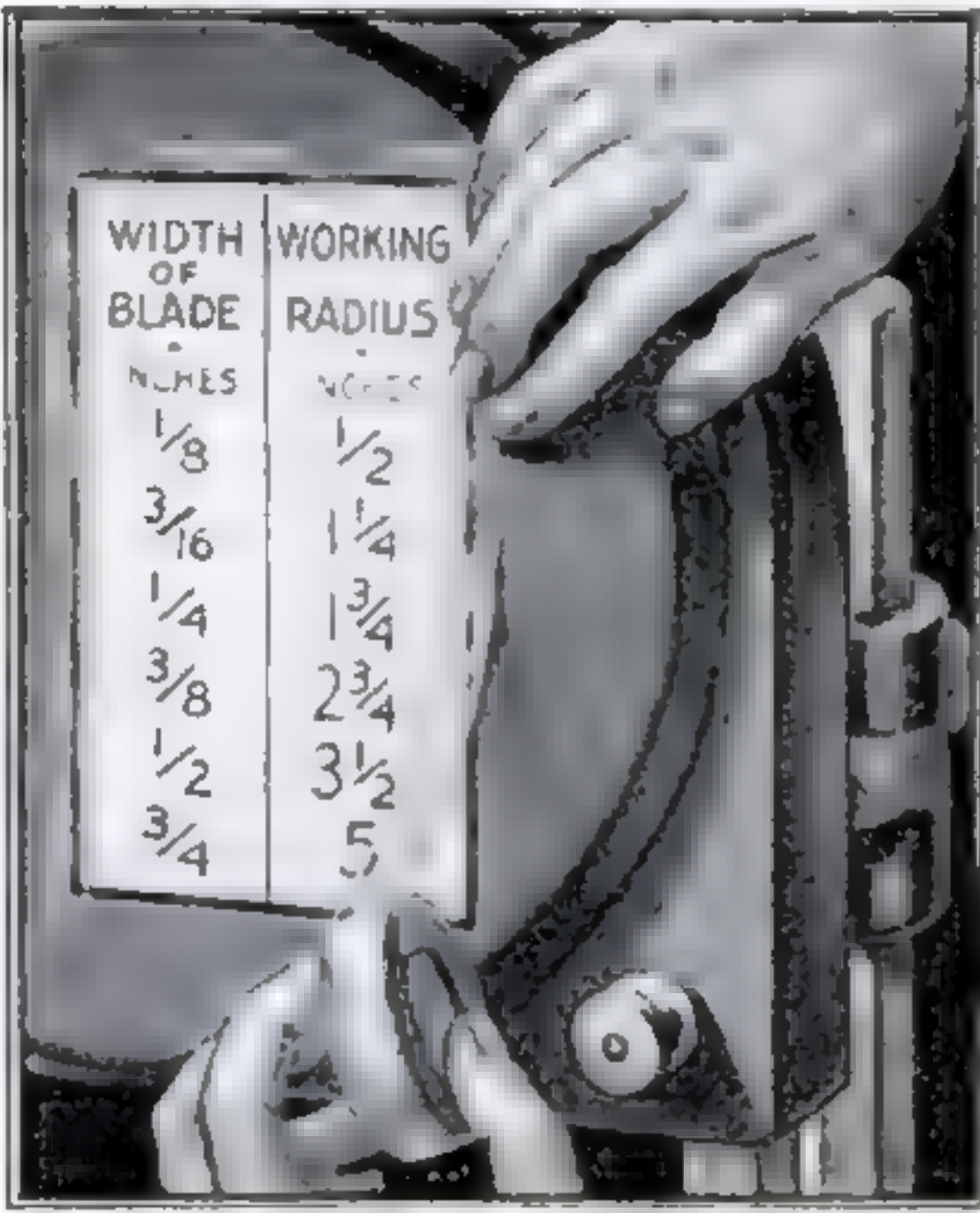


Using a dressing tool to true a wheel. See that the bearings are free from play and be sure to wear goggles

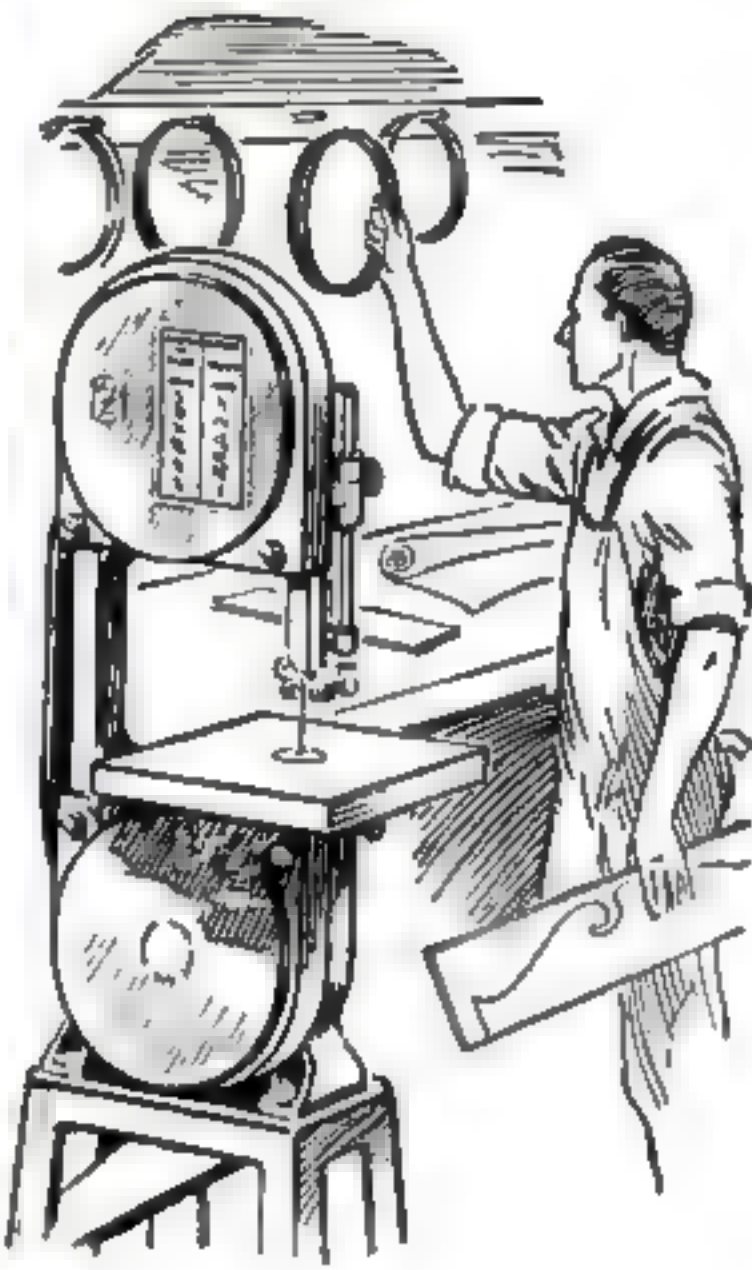


# Chart on Band Saw Shows Which Blade to Choose

IN THE operation of the band saw, it is best to use the greatest width blade that the work will permit. To enable the worker to determine this quickly, the chart shown may be fastened with cellulose mending tape to the upper wheel guard. On the chart are the different sizes of blades and the working radius of each. The working radius is the smallest radius that the blade will cut easily and safely. The saw selected for the work should have a working radius as small as the radius of any circle in the work to be cut. When cutting combination curves, plan the cuts in advance.—H.H.



| WIDTH OF BLADE<br>INCHES | WORKING RADIUS<br>INCHES |
|--------------------------|--------------------------|
| 1/8                      | 1/2                      |
| 3/16                     | 1 1/4                    |
| 1/4                      | 1 3/4                    |
| 3/8                      | 2 3/4                    |
| 1/2                      | 3 1/2                    |
| 3/4                      | 5                        |

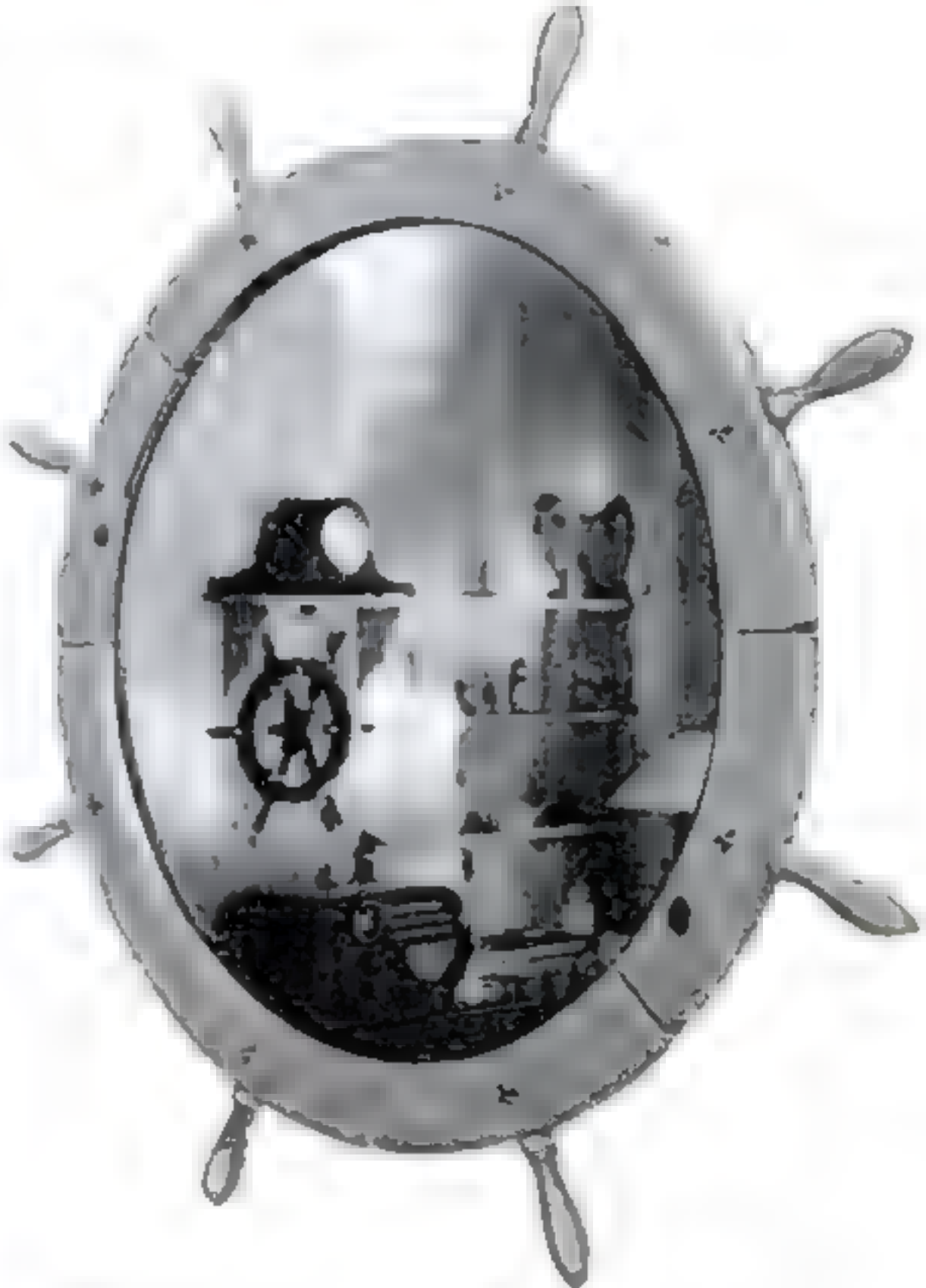
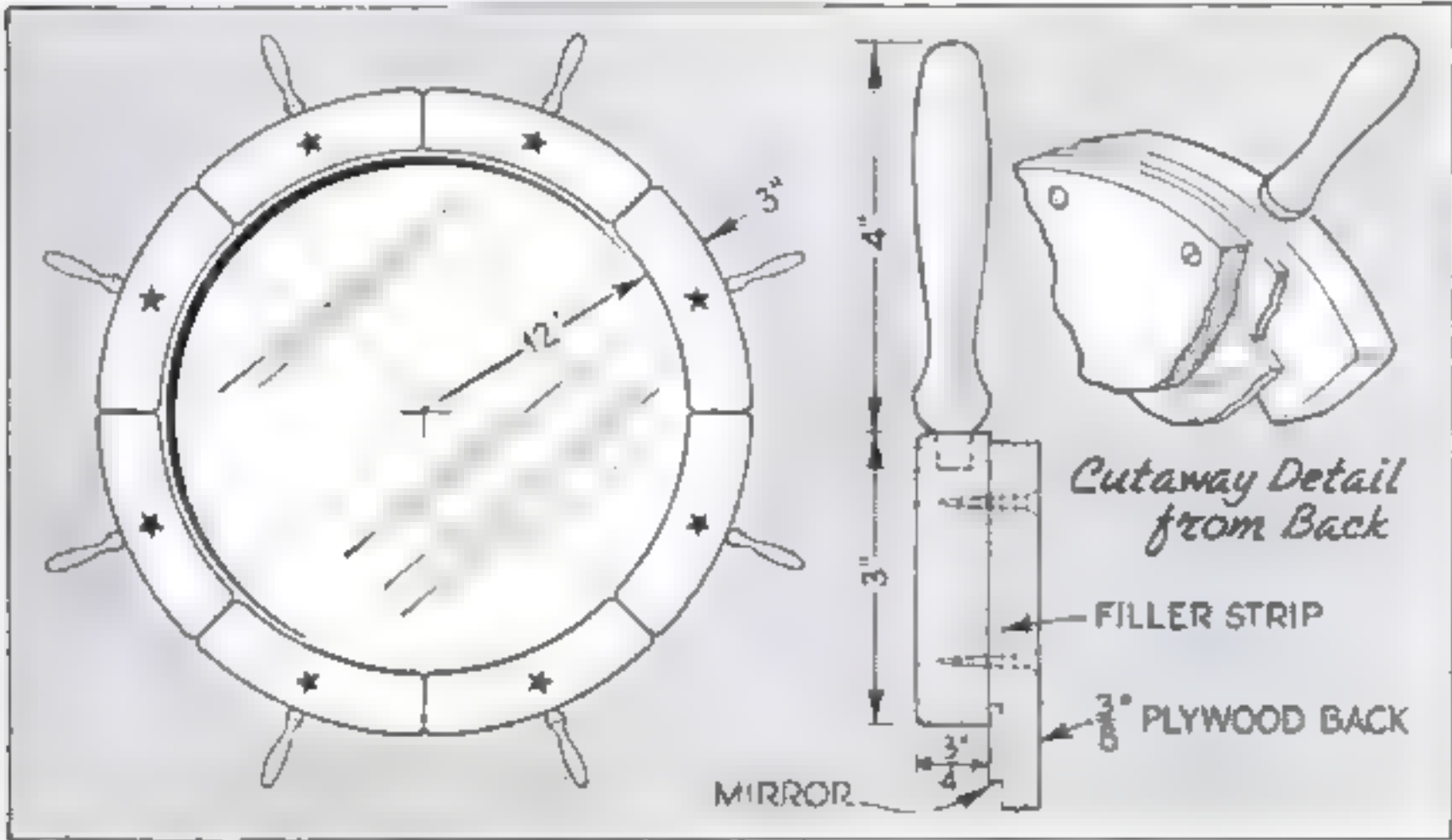


## Small Brushes Kept Soft in Tubes

SMALL paintbrushes can be kept soft and in good condition by using a rack like that illustrated. The backpiece is 3/4" by 2" by 32". Spring-clip clothespins are glued or fastened with small brads to this piece so that the brushes will be held about 3 1/2" apart. The lower piece is of the same size but has holes bored to hold 3/4" test tubes centered directly below the notches in the jaws of the clamps. The flanges of the test tubes are recessed by first counter-boring 1/16" with a 15/16" auger bit; then the piece is bored through with a 13/16" bit. Slots 3/4" wide are cut into the piece to the holes so that the test tubes can be removed. The tubes are partly filled with the proper liquid to preserve the brushes.

## A Pilot-Wheel Mirror Frame

FRAMED in a replica of a sailing-ship pilot wheel, this 24" mirror is unusually decorative. The piece can be duplicated by anyone accustomed to simple scroll-saw and lathe work. The outer frame is made up of eight separate segments with a handle in each. The stars are metal, chromium plated. Casein glue and brass screws are used in assembly.—H.S.



This mirror hangs in the beach home of W. H. Fawcett, Balboa Island, Calif.



# New U.S. Destroyers

IN PRECEDING articles of this series we have described models of the new capital ships that are being completed for the U. S. Navy. A well-balanced fleet, however, also includes what are generally classified as "torpedo craft," and we are therefore adding to our miniature scale-model squadron a new flotilla leader, two recent types of destroyers, and a submarine of the latest design.

The chief characteristics of these ships may be tabulated as follows:

| Type                            | Flotilla Leader | Destroyer    | Destroyer      | Submarine      |
|---------------------------------|-----------------|--------------|----------------|----------------|
| Name                            | <i>Winslow</i>  | <i>Mahan</i> | <i>Gridley</i> | <i>Pompano</i> |
| Identification number           | 359             | 364          | 380            | P-10           |
| Date of launching               | 1936            | 1935         | 1936           | 1937           |
| Displacement tonnage            | 1,850           | 1,450        | 1,500          | 1,330          |
| Dimensions (lxbxd)              | 372x36x10       | 334x34x9½    | 334x34x9½      | 290x25x14      |
| Horsepower                      | 50,000          | 42,800       | 42,800         | —              |
| Designed speed (knots)          | 37              | 36½          | 36½            | —              |
| Number of ships in class        | 8               | 16           | 10             | 6              |
| Range of identification numbers | 356/363         | 364/379      | 380/389        | P5/P10         |

All the new destroyers are larger, faster and more heavily armed than the familiar war-built "four-stackers." The flotilla leaders are an entirely new type for the U. S. Navy. The ships are actually small cruisers serving as flagships for the destroyer squadrons. One flotilla leader is assigned to each destroyer squadron, which consists of twelve destroyers in three divisions of four ships each. It is therefore recommended, since torpedo craft rarely operate singly, that enough models be built to constitute a division. This division could consist of one flotilla leader and two each of the destroyer types described in this article. The submarines operate in divisions of six vessels each.

In spite of the many small details, there is nothing difficult in the construction of these models. They are built to the same scale as the

larger ships in this series—1" equals 100'. All parts are cut or shaped from wood or thin cardboard and assembled as indicated in the drawings, which are full size. Thin stiff wire is used for masts and guns. The torpedo tubes

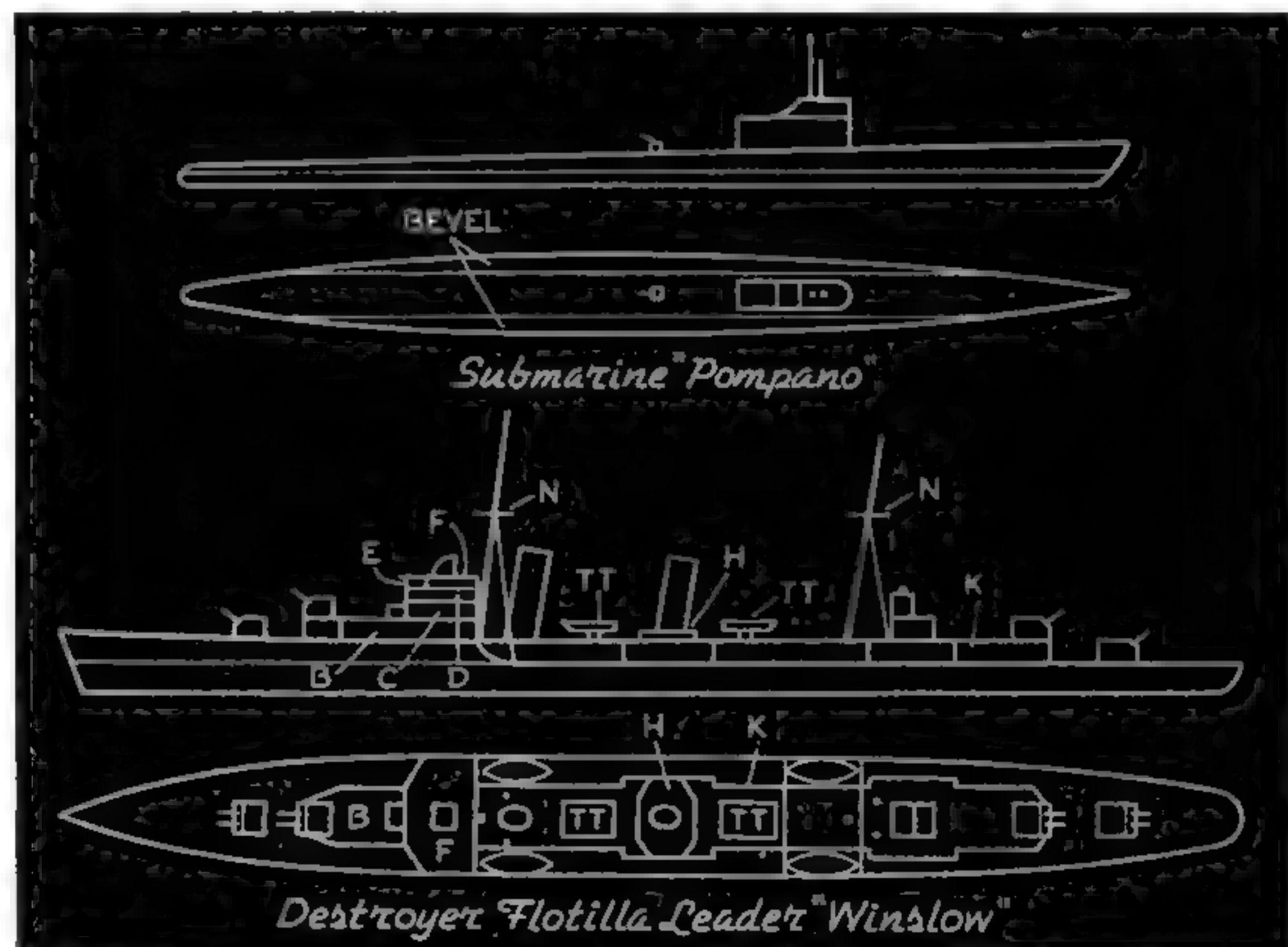
## LIST OF MATERIALS

For a division of five destroyer models

- 5 pc. wood 3/32" by 3/8" by 6" for hulls.
- 2 pc. wood 1/16" by 1/4" by 6" for deck houses, etc.
- 1 pc. wood 1/32" by 3/8" by 6" for TT, D, etc.
- 1 pc. cardboard 2" by 2" for F, L, M, etc.
- 24" thin, stiff wire for guns, masts, etc.
- 1 pc. 3/32" round brass tubing 4" long for funnels.
- Gray paint, glue or cement, etc.

For each submarine model

- 1 pc. wood 1/32" by 1/4" by 3" for hull.
- 1 pc. wood 1/8" by 1/8" by 3" for superstructure.
- 1 pc. wood 3/32" by 1/8" by 3/8" for conning tower.
- About 2" thin, stiff wire; 1 very small bead; gray paint.



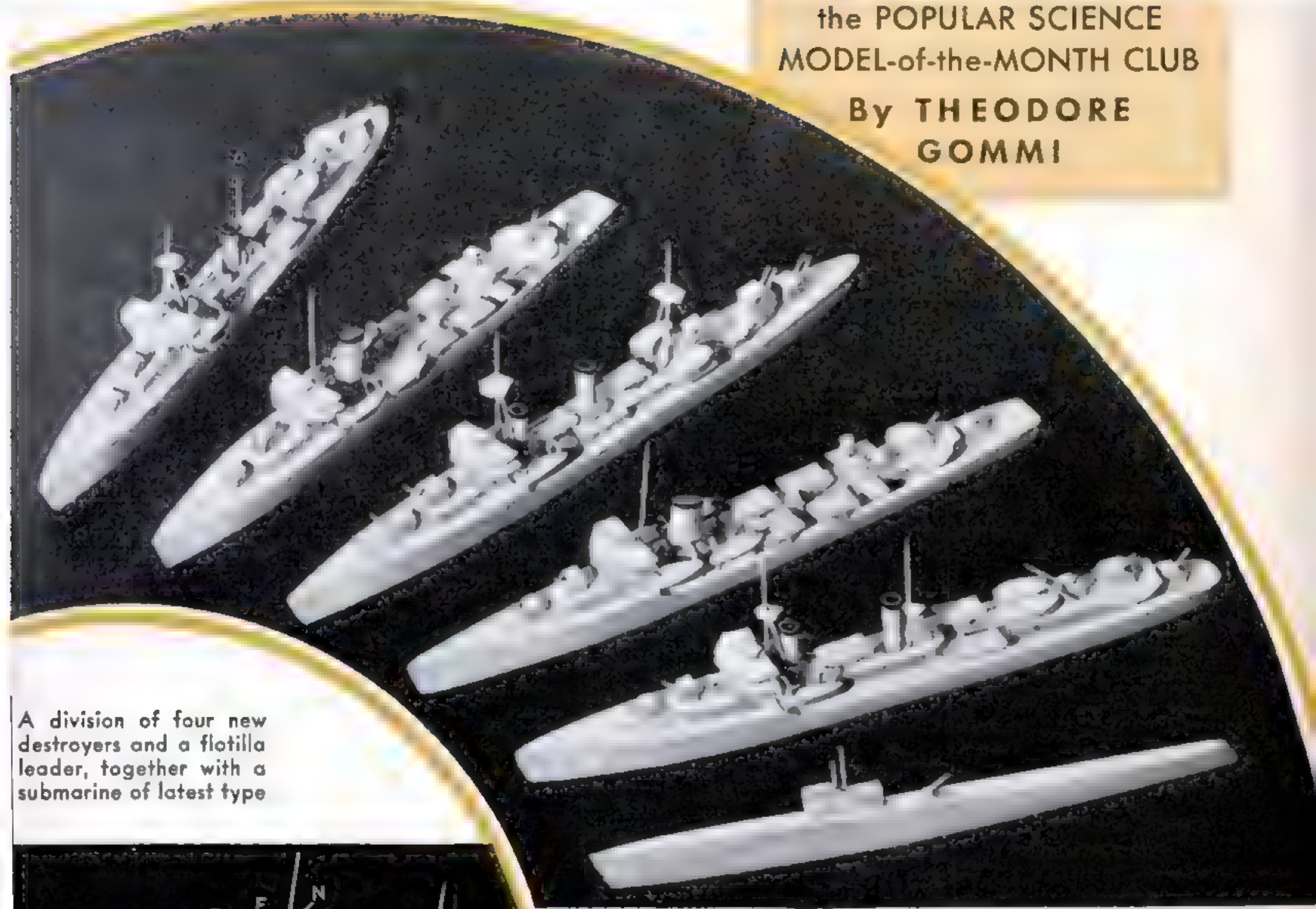
Full-size side elevations and plan views of water-line models of the submarine "Pompano" and the destroyer flotilla leader "Winslow." The scale is 1" to 100'



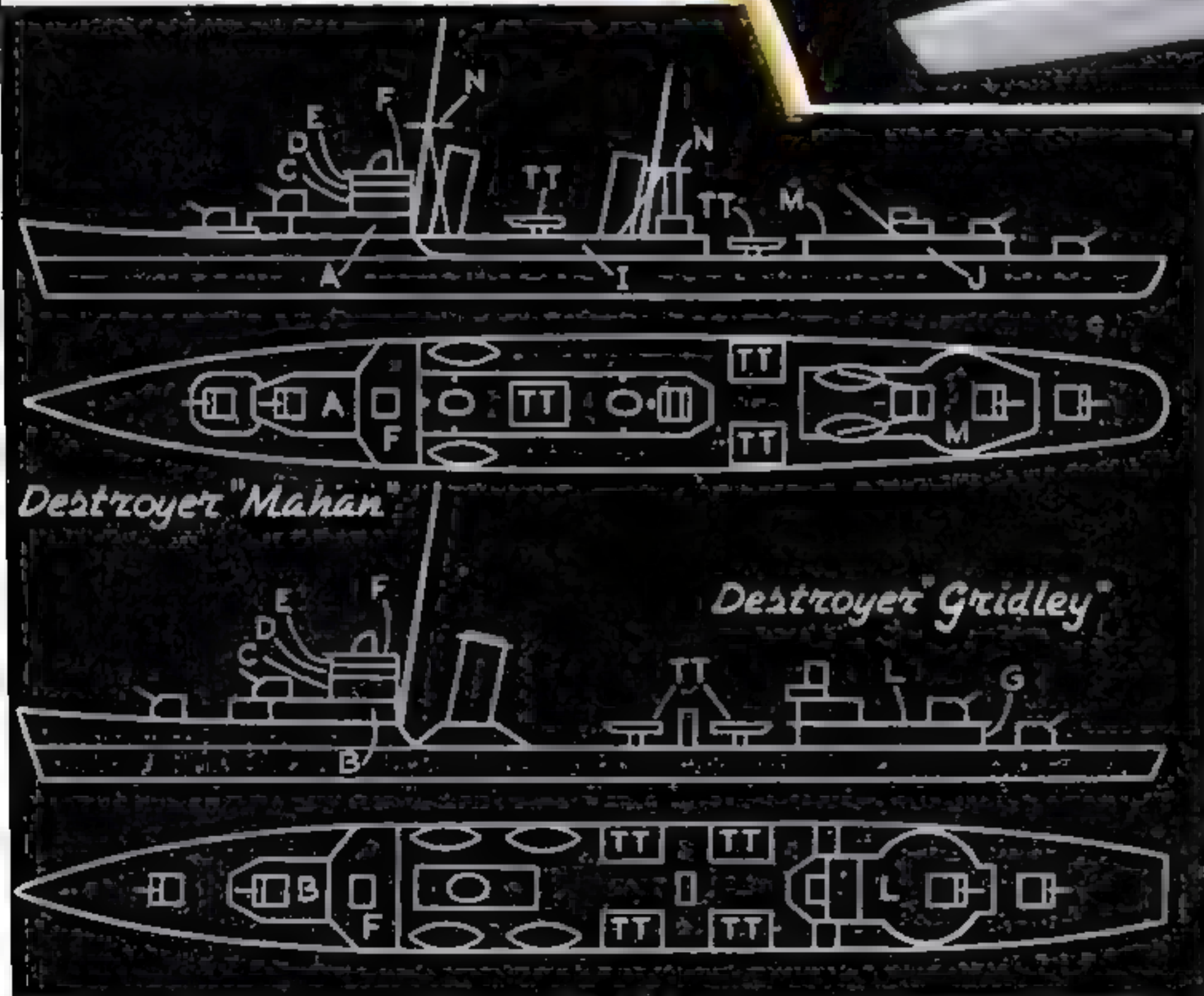
# and Submarines

Miniature  
Water-Line Models  
Designed Especially for  
the POPULAR SCIENCE  
MODEL-of-the-MONTH CLUB

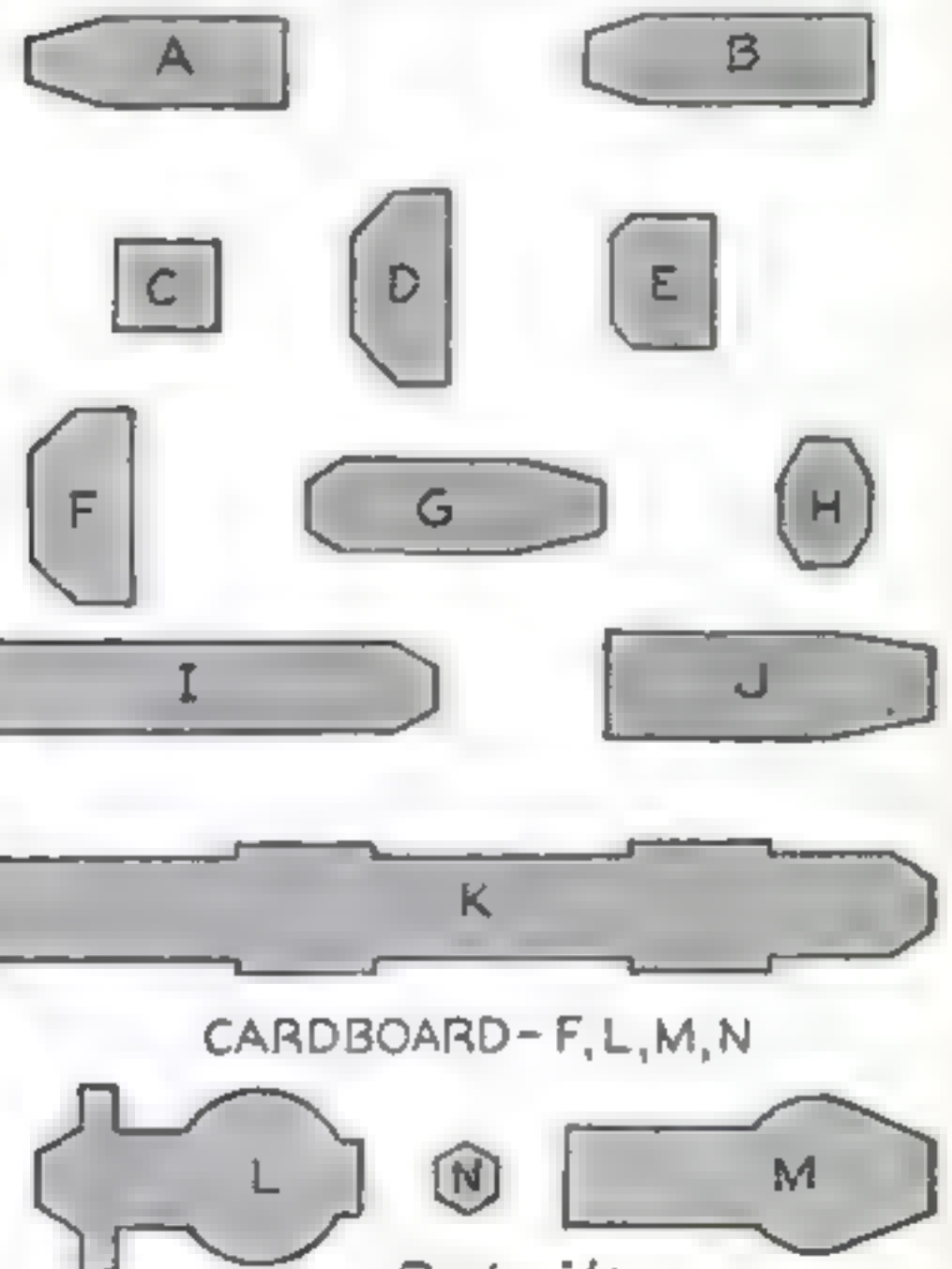
By THEODORE  
GOMMI



A division of four new destroyers and a flotilla leader, together with a submarine of latest type



PARTS D, E, H -  $\frac{1}{32}$ " THICK  
PARTS A, B, C, G, I, J, K -  $\frac{1}{16}$ " THICK



CARDBOARD - F, L, M, N

Details

The upper of these two models is the destroyer "Mahan," and the lower one is the "Gridley." Some of the principal parts appear full size at the right



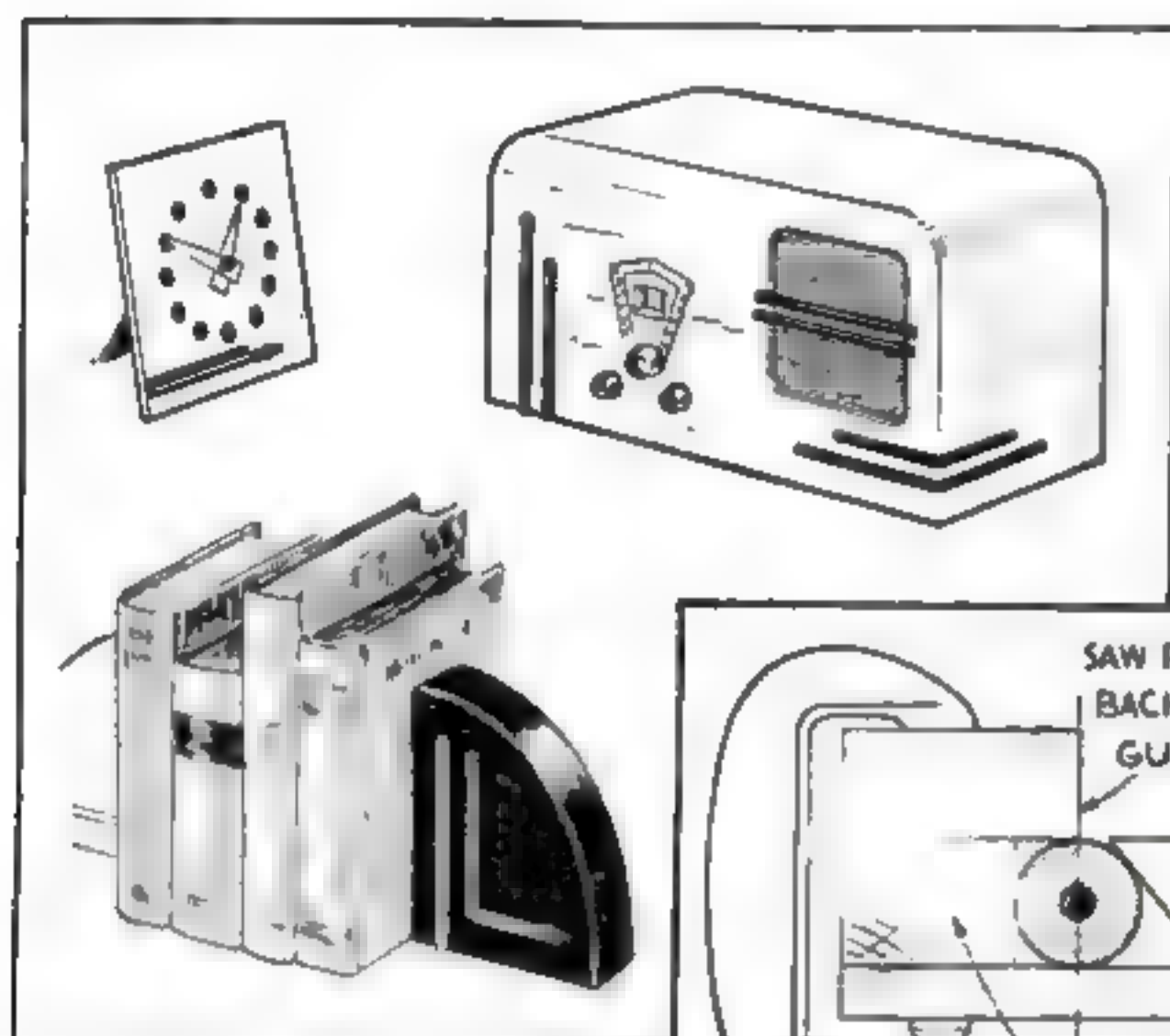
(TT) are formed by filing three grooves on the top surface of a rectangular piece of 1/32" wood. The funnel of the destroyer *Gridley* is best made of wood. The funnels of the destroyer *Mahan* and flotilla leader *Winslow*, however, can be made of brass tubing 3/32" round. The platforms (N) are small hexagons of cardboard slipped over the mast and held in place by a drop of glue. For the sake of clarity, lifeboats have been omitted from the side-elevation drawings, but they are fastened to the hull as indicated in the plan. The boats near the forward funnels may be suspended

from wire davits for a more realistic effect.

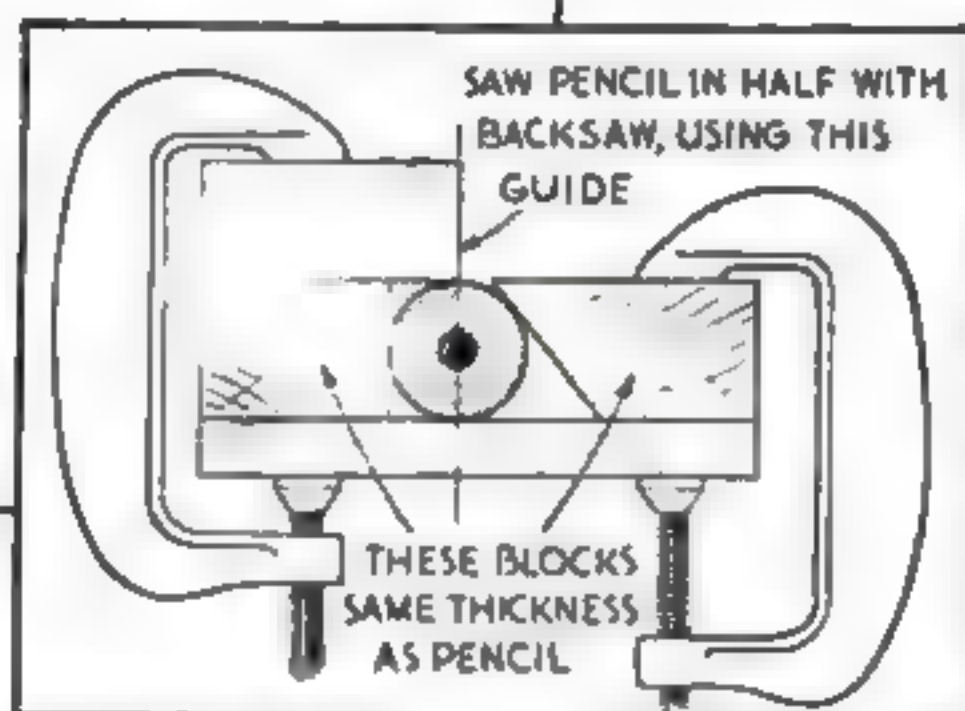
The submarine hardly requires description. The wood is cut and assembled according to the drawings. The periscopes are pieces of wire, while the gun is bent wire inserted into the deck through a small bead.

All these models are to be painted battleship gray. The distinguishing numerals, so characteristic of the destroyers, must not be omitted. With a very thin brush, these can be painted in white. The numbers assigned to these ships are given in the preceding tabulation.

## Small, Decorative Moldings Made from Pencils



Craftwork articles of modern design may be decorated with half-round moldings made from pencils, planed flat or sawed in half



**H**ALF-ROUND moldings are frequently used to ornament furniture and craftwork articles designed in the modern style. When the projects are small or medium in size, such as, for example, book ends, table radios, clock cases, magazine racks, trinket boxes, and smoking cabinets and stands, it is frequently possible to use pencils from which to make suitable half-round moldings. They merely have to be sawed lengthwise or planed flat.

The advantage of using pencils is that they are available everywhere in many colors, from gleaming black to polished natural grain, and they require no further finishing when carefully prepared and applied.

The pencils may be placed against a bench hook or stop and the printed portion planed off until the center is reached. They also can be sawed in half with a fine-toothed backsaw provided a guide block is clamped over the center as shown in one of the drawings above. The moldings are held in place with a quick-setting glue or cement.—ERNEST F. HOGAN.

One way to prepare the pencils is to clamp them with a guide strip along the center as shown above and cut them with a fine-toothed backsaw. The pieces are then glued on as at the right



## Rubber Bands Muffle Noise of Lawn-Mower Wheels

BOYS and men who pick up an odd job of lawn mowing here and there can push their lawn mowers along the pavement from one place to another with much less noise if the wheels are covered with rubber. Simply spread a little tire cement on the rims and stretch over each a band cut from an old inner tube. Make the bands slightly wider than the rims since they decrease in width when stretched. The rubber is easier to cut if both it and the knife are wet. If possible, have an assistant hold the mower between his knees and take some of the strain off the fingers with a pair of screw drivers while the bands are being slipped in place.—JACK HAZZARD.





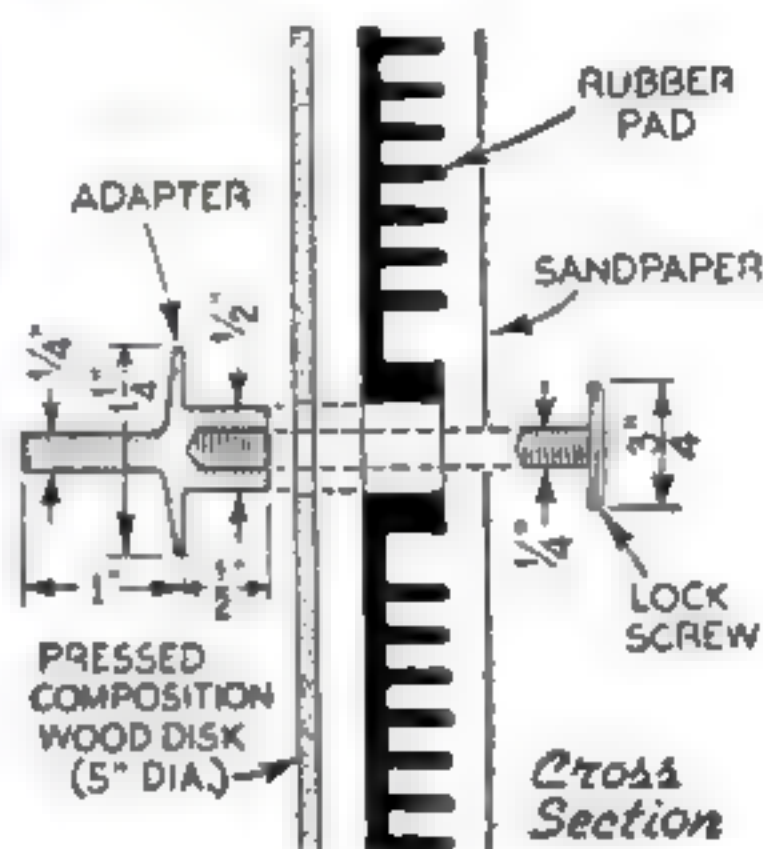
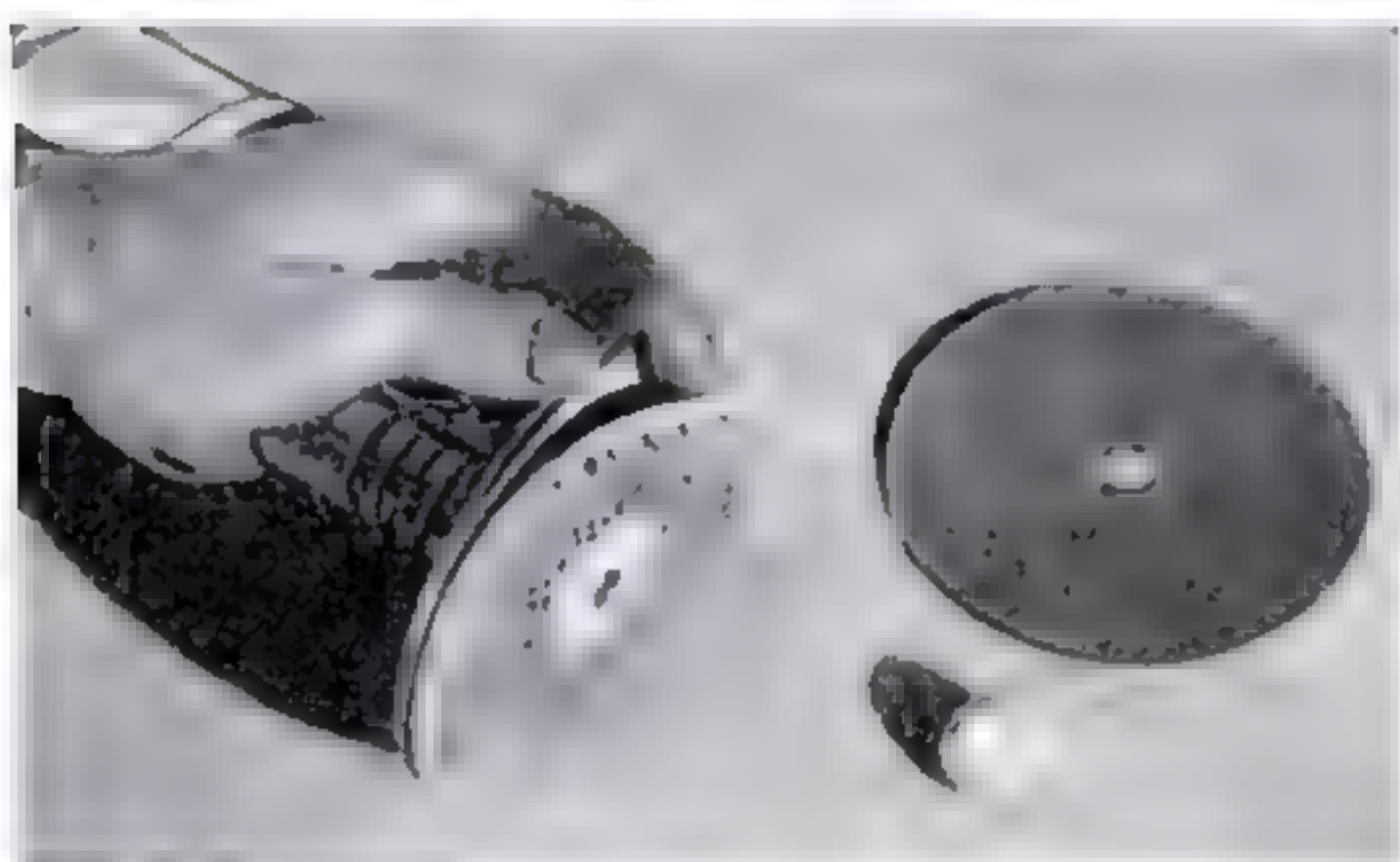
## Ventilated Rubber Disk Makes Sandpaper Last Longer

**S**ANDING disks will last longer and do a better job if a soft backing and some means of keeping the sandpaper cool are provided. Since the disk illustrated was to be used on a  $\frac{1}{4}$ " drill, the adapter was made with a  $\frac{1}{4}$ " shank.

The stiff disk may be either pressed composition wood or sheet metal. The soft backing piece in this case was made from a discarded counter money pad covered with small rubber fingers. It had a solid rubber center, which was bored to fit the adapter. The lock-

screw head may be made very thin. The tightening is done by turning the sandpaper disk.

The little rubber fingers prevent the paper from tearing when pressed against a sharp corner, and they also provide an air space that keeps the paper cool even after continued use.



## Bottom of Garbage Cans Painted to Check Rust

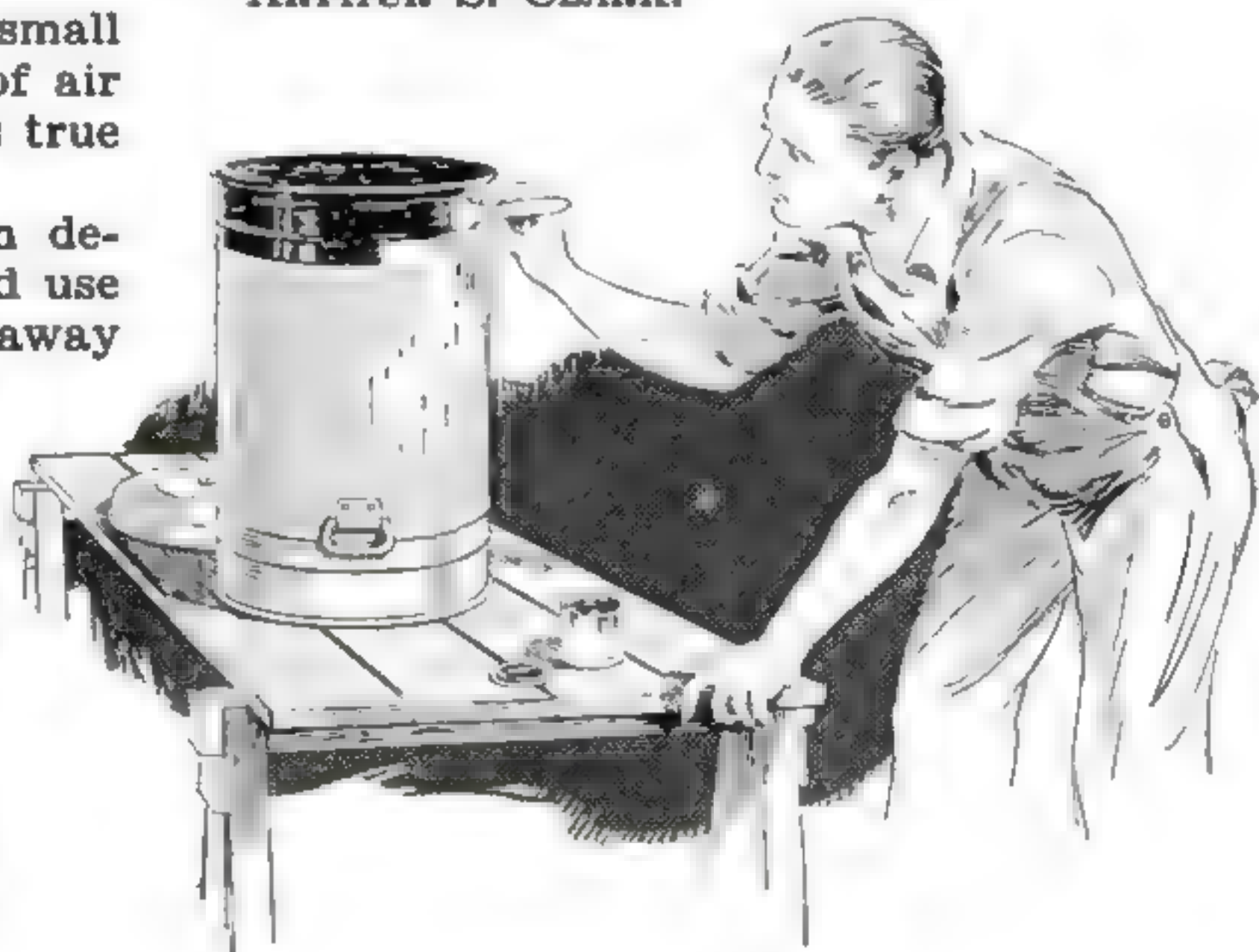
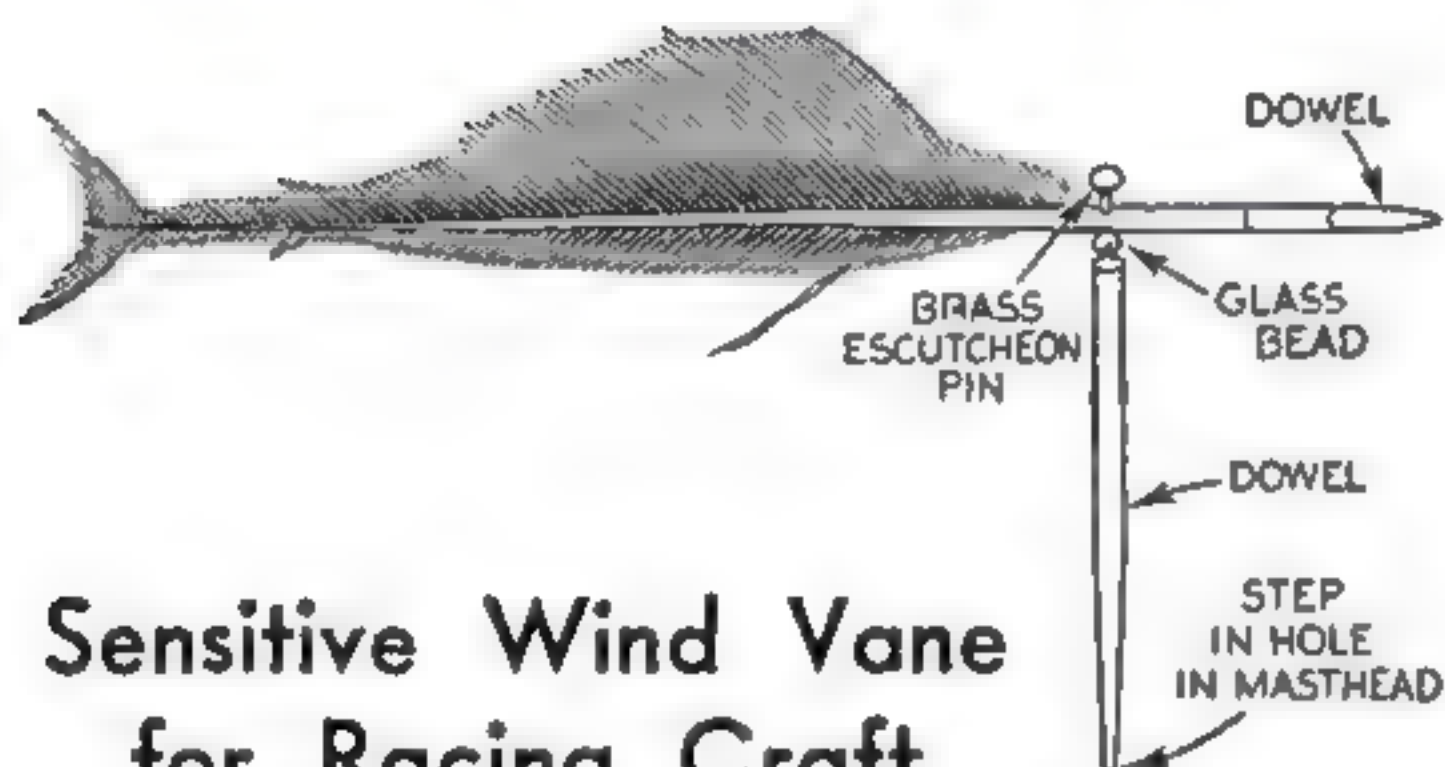
**T**HE life of an ordinary garbage can may be lengthened considerably by applying a coat of good paint to the bottom and a few inches up the sides, both inside and out, since moisture from the garbage and from the ground soon rusts out the bottom of the can. An occasional renewal of the paint will protect the can from rust almost indefinitely. Use a black or dark-colored paint.

—ARTHUR S. CLARK.

## Sensitive Wind Vane for Racing Craft

**S**O SENSITIVE is this wind vane for small racing craft that the slightest breath of air actuates it, and in a real blow it points true and steady into the eye of the wind.

Make a paper pattern of the design desired, glue it lightly to the feather, and use a very sharp knife or razor blade to cut away the unneeded parts. Then remove the pattern. Insert the pin and work the quill around until it turns freely. Glue a piece of wood in the pointer end of the quill. Now place the nearly completed vane on a razor blade and cut and file away the dowel until the feather balances perfectly at the pivot point. Place a glass bead between the underside of the quill and the support, which may be a  $\frac{3}{16}$ " dowel. The latter is stepped in a small hole in the masthead.—J.H.

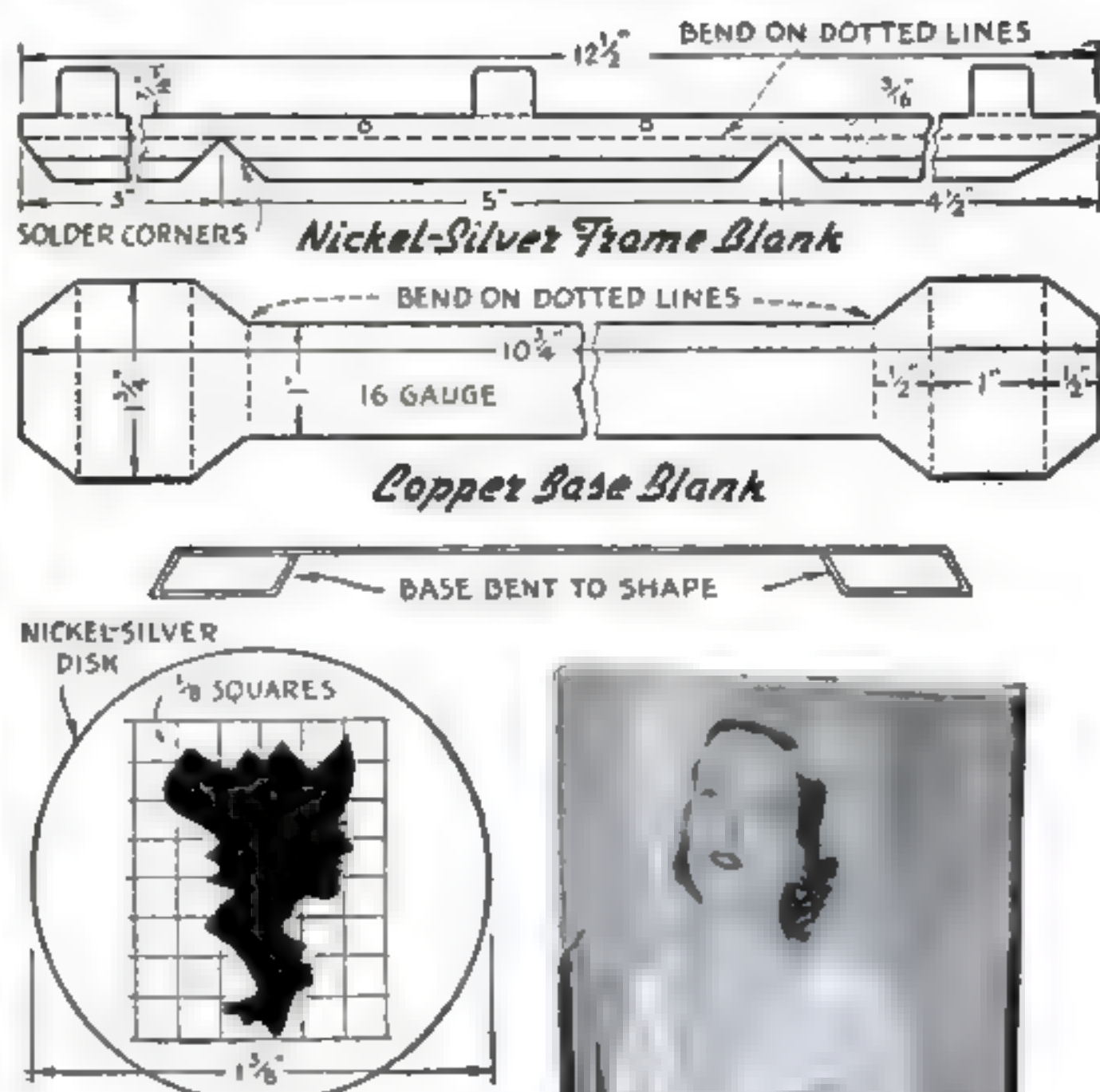




# Modern Two-Toned Photo Stand



The corners of the frame may be soldered with a small alcohol blowtorch after all the coloring has been done



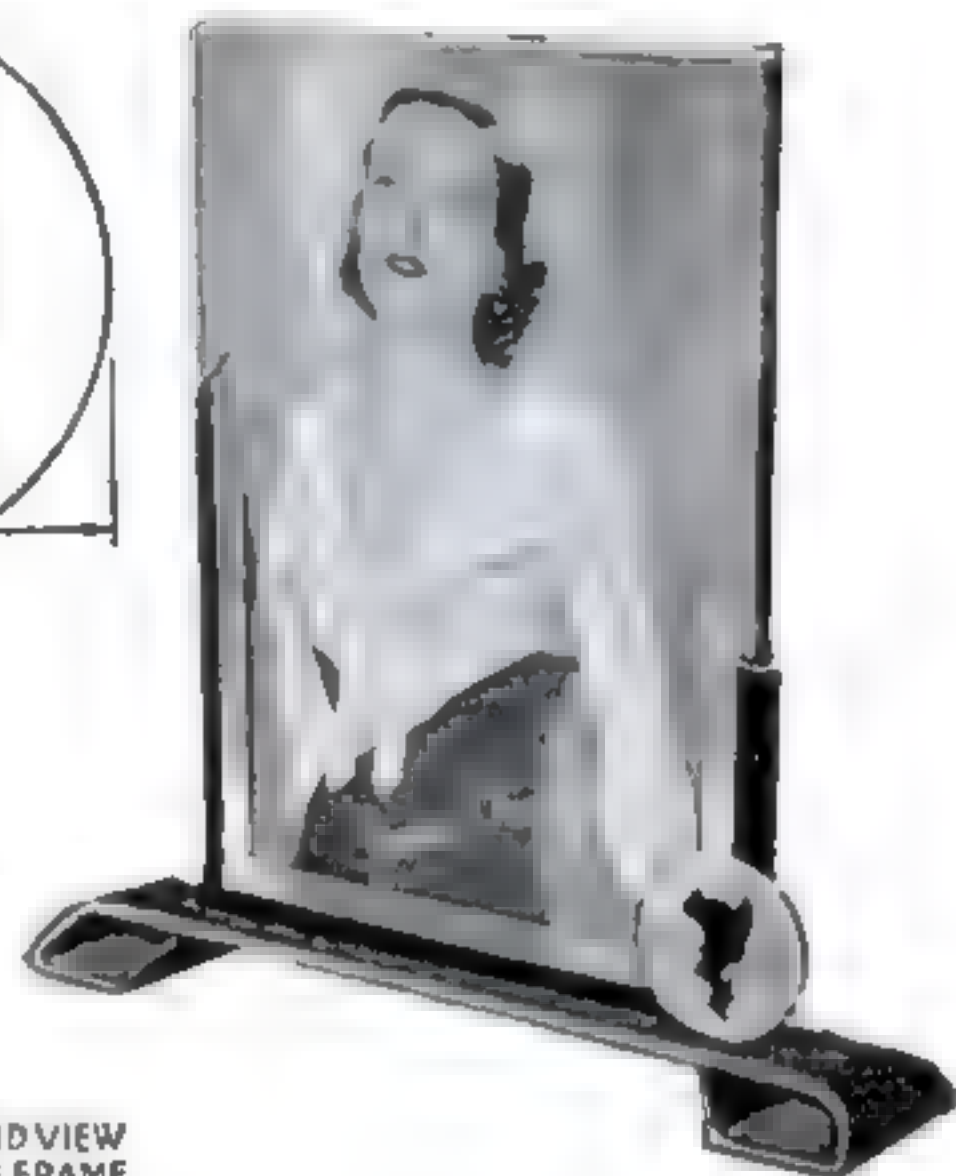
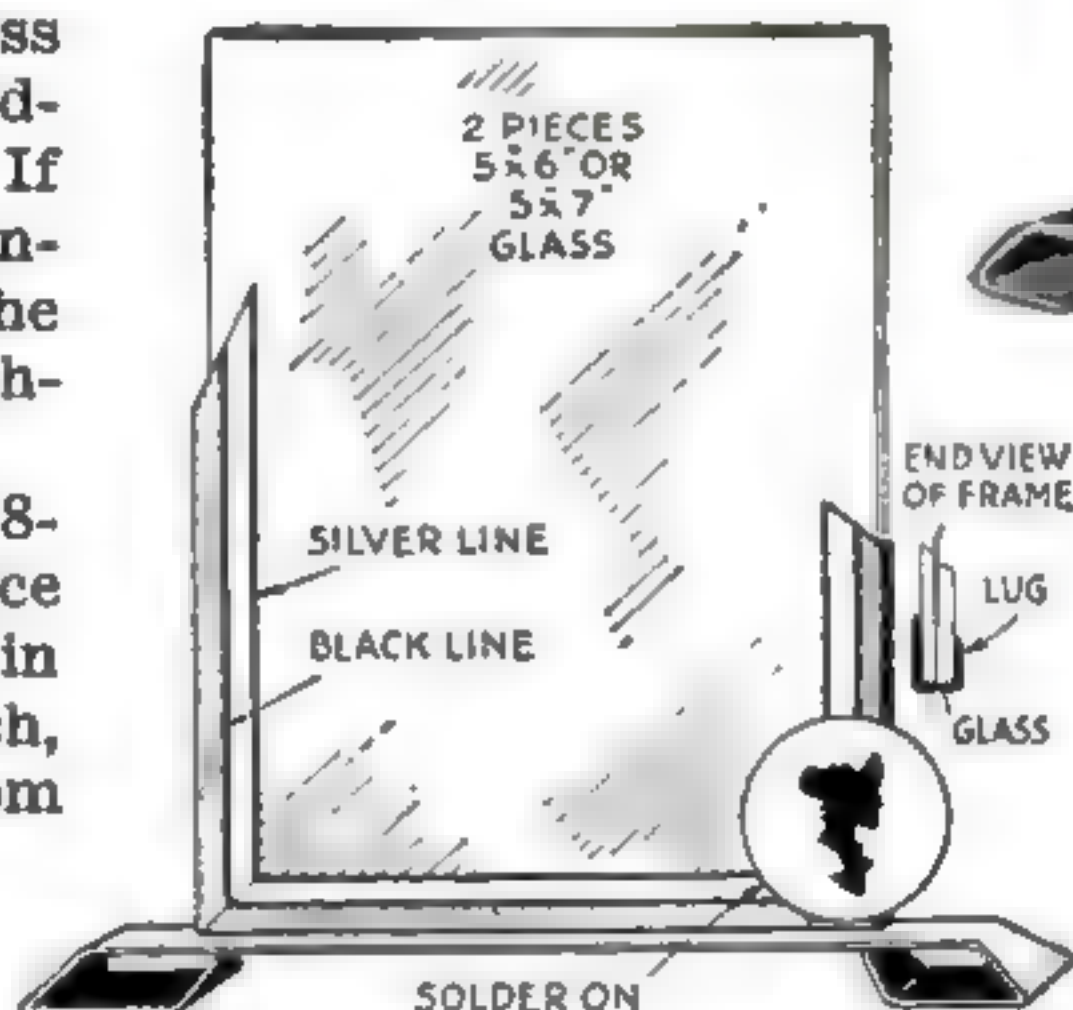
**N**ICKEL silver, copper, and glass are used for making this modern, two-toned photo stand. If any difficulty is experienced in obtaining the necessary nickel silver, ask the assistance of the industrial-arts teacher at some near-by high school.

Lay out and cut the frame from 18-gauge nickel silver, hammer the face side with a planishing hammer, cut in the lines as shown with a lining punch, and bend to shape. The base is cut from 16-gauge soft sheet copper, hammered, and formed. For the decorative disk, nickel silver is used.

The silhouette, for which any desired design or monogram will serve, is either etched or set in with a punch. If etching is preferred, paint all the disk but the design itself with asphaltum varnish, let it dry, and then immerse it in commercial nitric acid for about a minute. Wash it thoroughly and remove the asphaltum with kerosene.

To color the metal black, place a little nitric acid in a glass jar and drop in all the scrap copper the acid will consume. With a small swab apply this solution to the silhouette, to the entire base, and to all of the frame except the inside line. Then heat the metal until the treated surfaces turn black. Let cool, dust off, and repeat the operation until a perfect dead-black color has been obtained. Finally, polish with a good grade of floor wax.

Solder the corners, solder the disk in place, and rivet the frame to the base. To clean the silver portions, dip a small, clean swab into nitric acid and go over the bright parts. Be careful not to get any acid on the dark portions or it will take off the finish. Cut two

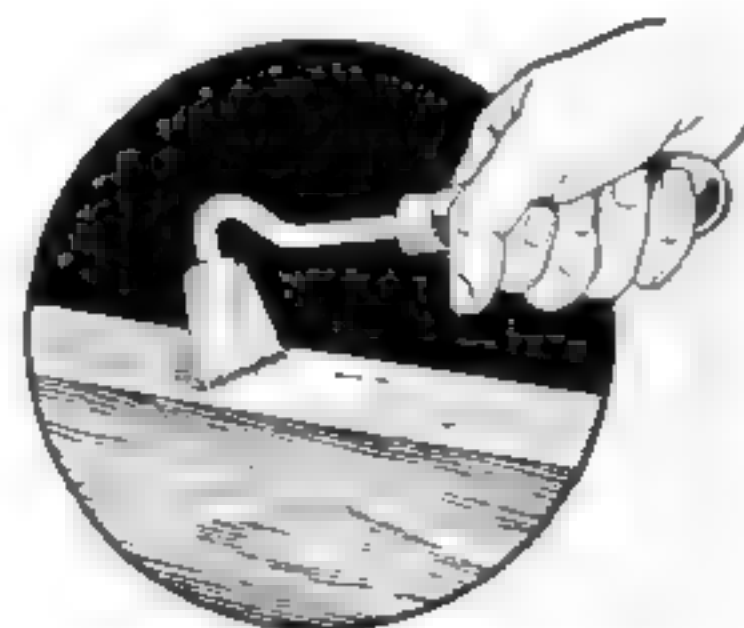


The holder into which the glass slides and the small decorative disk are nickel silver, parts of which are colored black by a solution of nitric acid and copper

pieces of glass, insert the picture between them, and slip them down into the frame. A second picture can face the other way, if desired.—DICK HUTCHINSON.

## Toothed Scraper Roughens Joints for Gluing

FOR roughening the surface of wood joints when necessary before applying glue, a hook scraper may be made by brazing a short piece of hack-saw blade (a heavy power-saw blade is best) to a suitable shank and fastening the shank in a file handle. One side of the teeth should be ground to a knife edge so that the teeth will present a line of sharp points. The steel is so hard that the scraper will remain sharp almost indefinitely.—W.N.C.





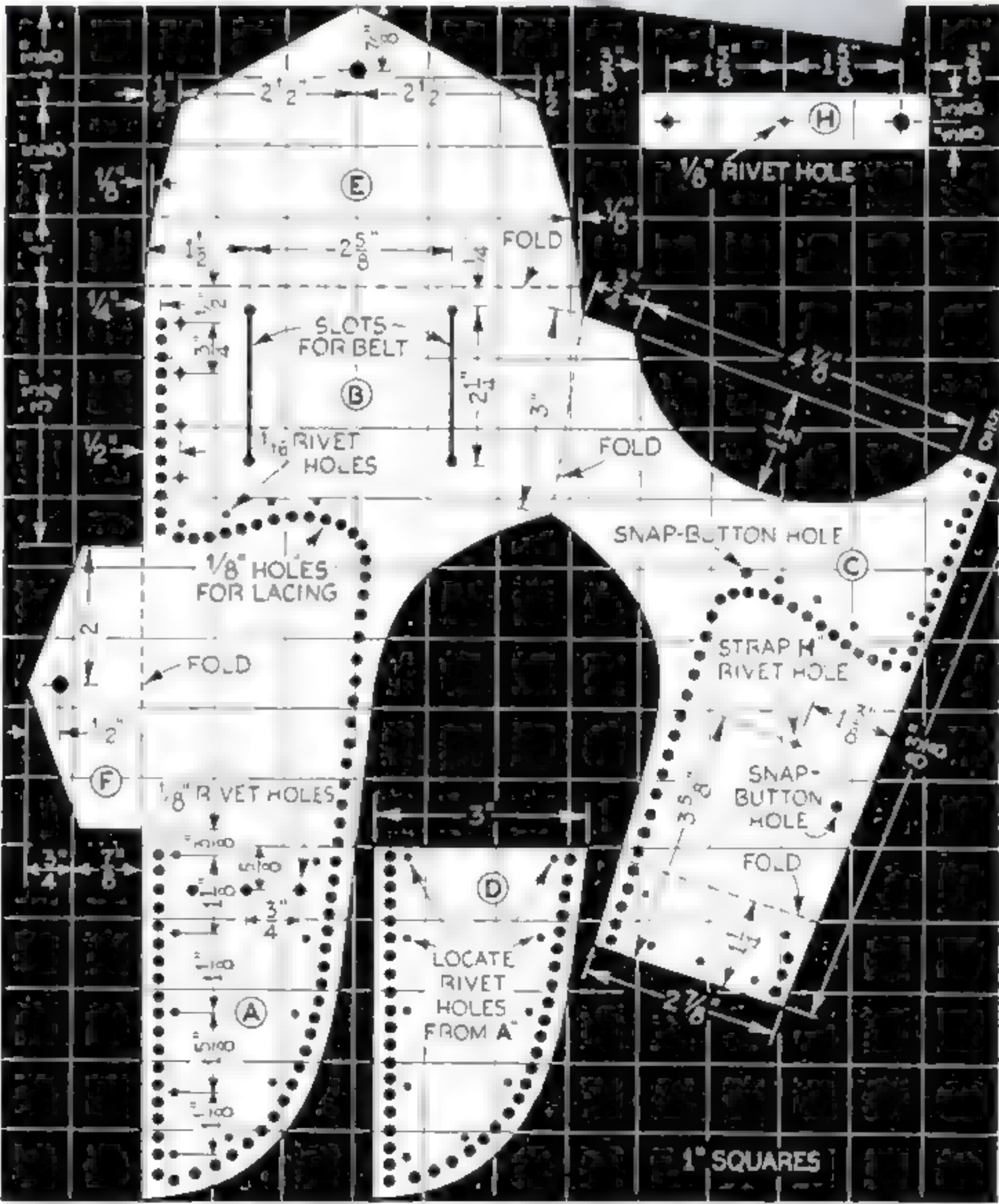
# Combination Ax and Knife Sheath



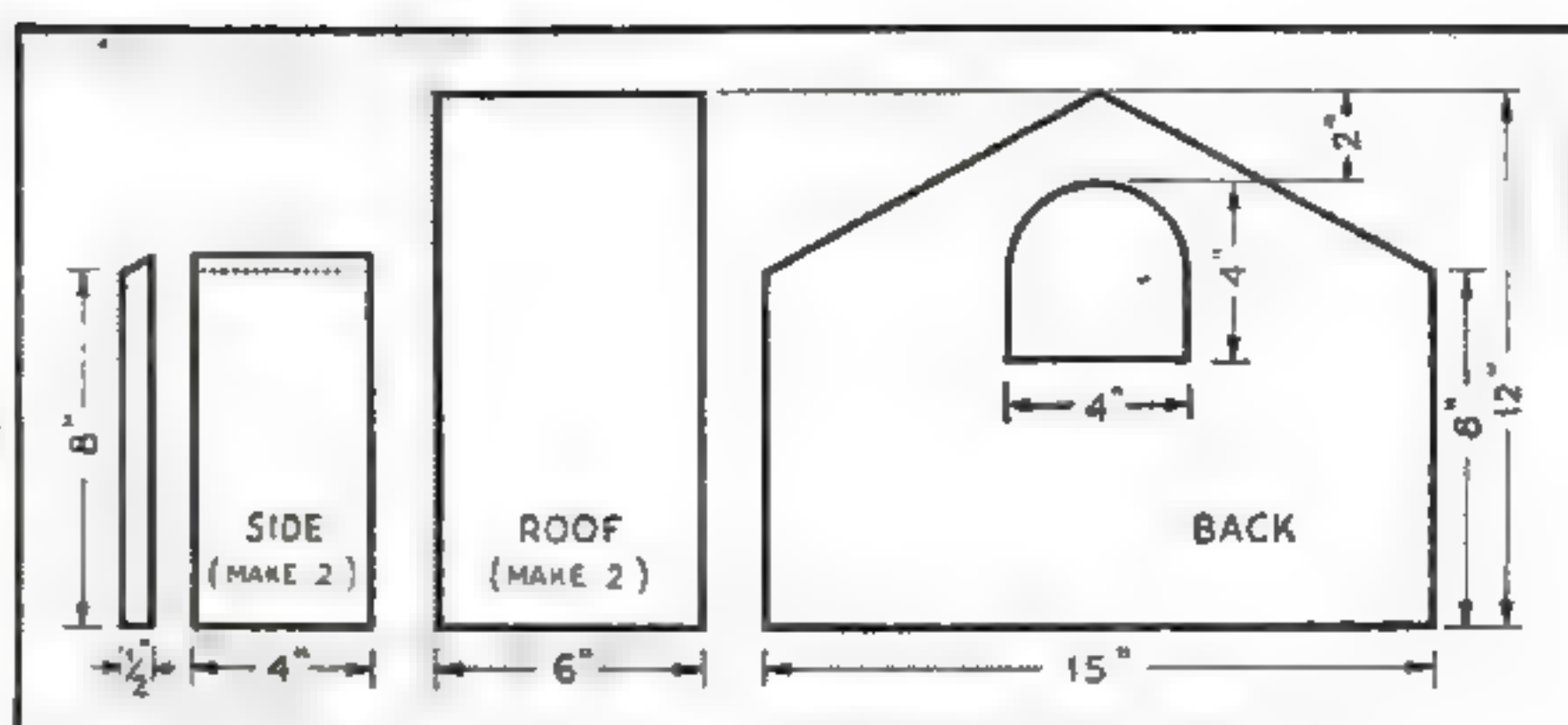
MANY accidents in camp and on the trail can be avoided if a combination sheath with an ax, knife, compass, and book of matches is carried.

A pattern is given for a sheath to hold the particular type of ax and 4½" woodcraft knife carried by the writer, but it can be changed to suit other styles. The leather, preferably heavy cowhide, should be about ⅛" thick, and 14" by 18". Punch ⅛" holes in A and B for lacing, also 1/16" and ⅛" holes for brass rivets. After folding, locate the holes on C.

Cut the belt slots before lacing and riveting. Skive the bottom part of C on inside of leather; then fasten C to A with three ⅛" brass split rivets before putting on the cover of the knife sheath D. Insert 1/16" split rivets to secure C to A and B. Then put D on A and fasten with 1/16" rivets. Lace with ⅛" rawhide or other lacing. Skive flap F. Add the knife-handle strap and attach the three snap buttons.—JAMES HORTON.







This unusual milk-bottle shelter is in the form of a miniature milk house with a Dutch milkmaid

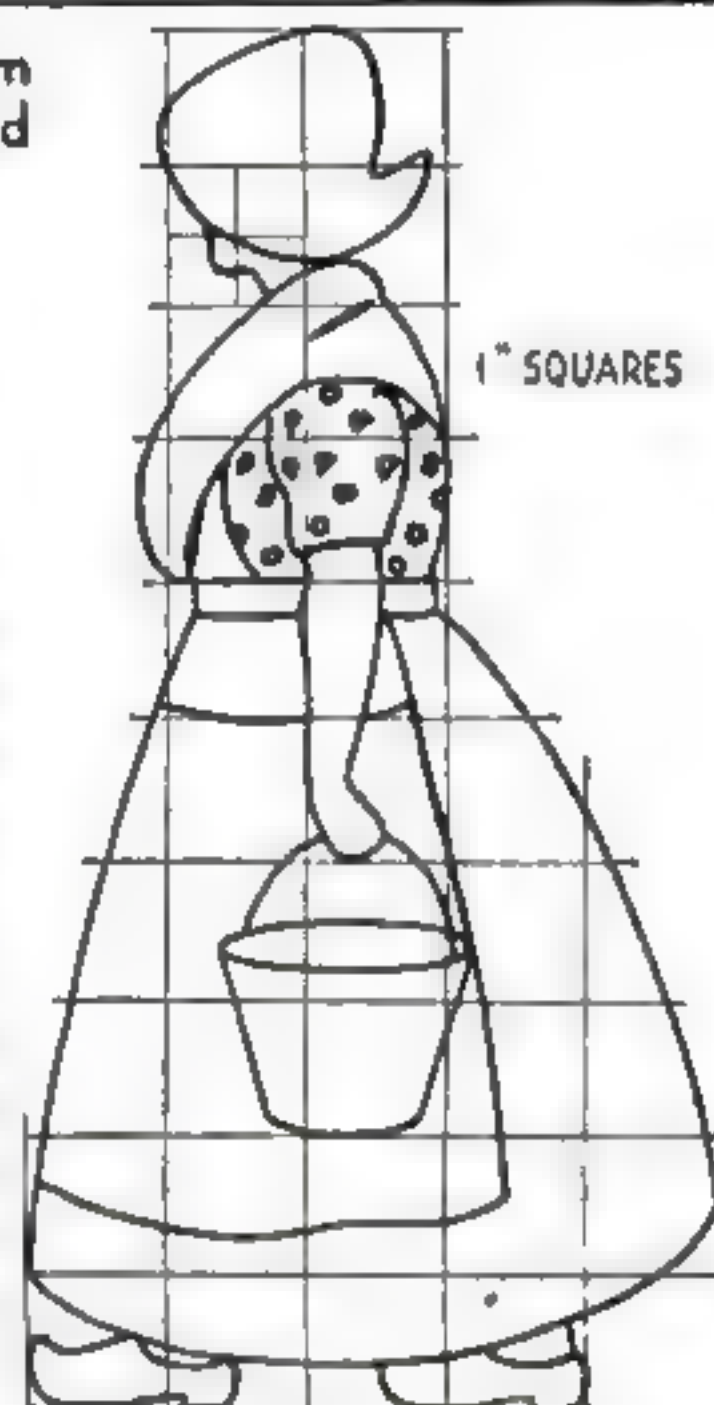
## Dutch Milk House Shelters Bottles from the Sun

**I**F YOUR milk bottles are left in an exposed or sunny spot, a little shelter like that illustrated above will protect them. It takes the form of a tiny milk house with a Dutch milkmaid.

Cut the sides and roof from  $\frac{1}{2}$ " wood, and the back and floor from somewhat thicker material.

A suitable color scheme for the milkmaid's costume is: red waist with white spots, blue skirt, white

cap, shawl, and apron with a checked top on the apron, and tan shoes. The pail may be two shades of brown. Creamy white is an appropriate color for the milk house. Painted lines to simulate shingles will add to its attractiveness. The milk house, with milkmaid attached, should be firmly fastened to the wall or porch of the house where most convenient. — HAZEL F. SHOWALTER.



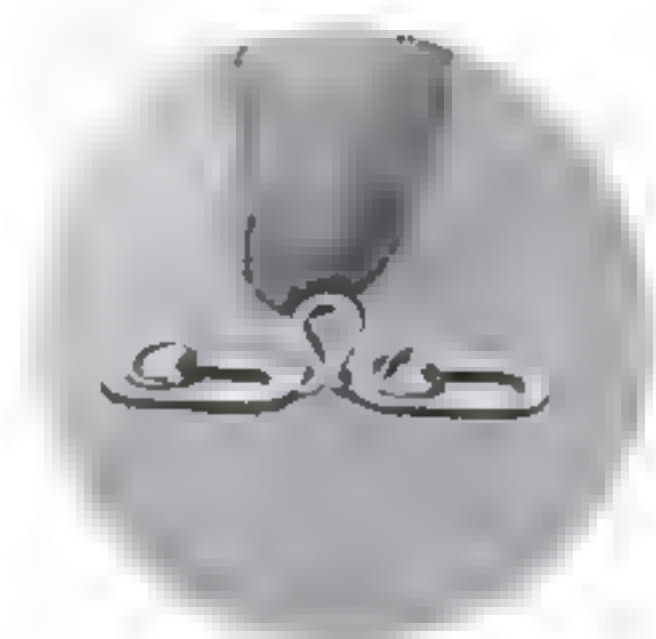
## Carrier for Garden Tools Cut from Old Nail Keg

**MADE** from a small nail keg, this garden basket will be found convenient for small tools, gloves, raffia and string, seed packets, and other small items of garden equipment. An empty keg may be obtained from a hardware store, lumber yard, or carpenter shop.

Two opposite staves are left full length, and the others are sawed off about halfway down. The two staves on either side of the those which project are cut on a curve as shown. Drill holes in the two high staves about  $2\frac{1}{2}$ " from the top to receive a piece of broomstick. Small pegs or dowel sticks are driven into drilled holes in the handle to secure it. — W. W. WHEATLY.

## Chain Links Form Neat Finger Latches

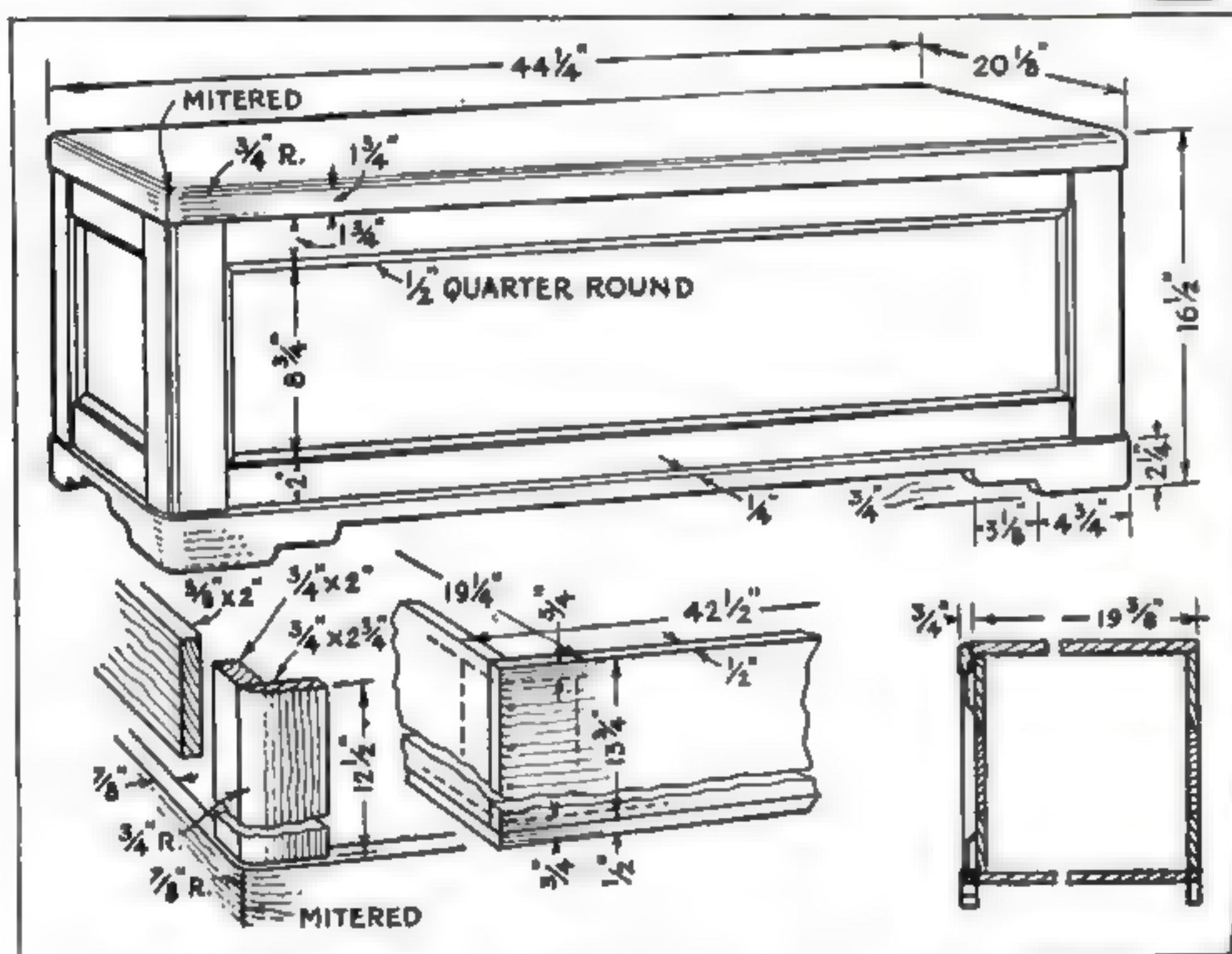
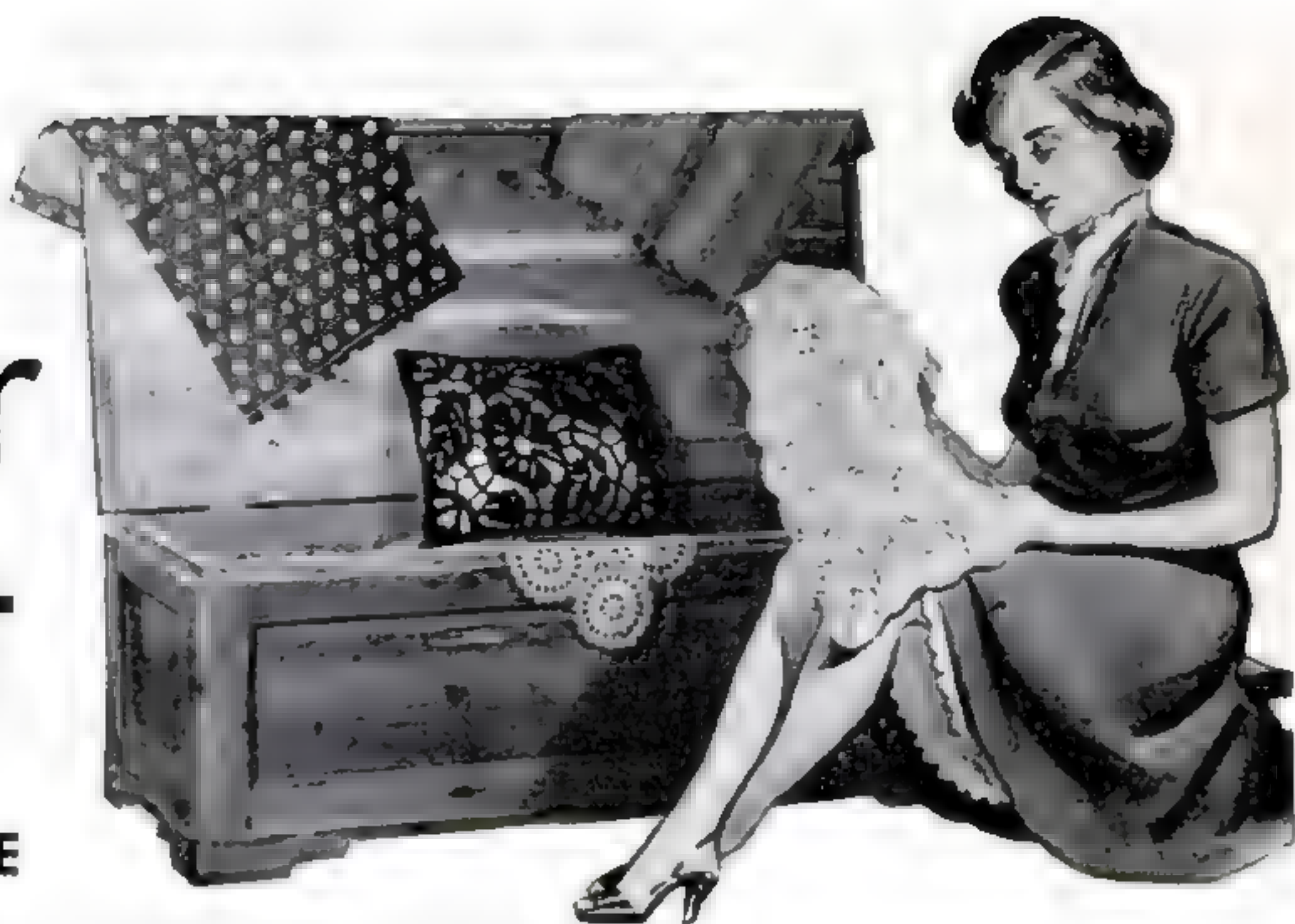
**N**EATER than the usual small wood or metal turn buttons used as catches for various purposes are finger latches made from safety-chain links as shown at the right. A link is opened up so it will lie perfectly flat and then fastened with two small roundhead screws to the fixed side of the opening, whether it be on some homemade photographic equipment, a cabinet, or anything else. Note that the screws are placed in such a way that the catch can slide back and forth. The projecting eye acts as a finger knob. — F. B.





# Red Cedar Chest

By  
EDWIN M. LOVE



Although it is simple to build, this cedar chest is substantial and will give lifetime service



The chest is essentially a box of red cedar nailed together with butt joints, then dressed up by adding the foot rails, corner pieces, and top and bottom rails. Right, corner detail

**F**EW pieces of furniture make more acceptable gifts than a good cedar chest. Here is one that is of modern, streamline design and paneled in a way that makes the construction very simple.

Select aromatic red cedar having as little white sapwood as possible. Dowel and glue the boards together to get material of the necessary width. The thickness of the stock should not be less than  $\frac{1}{2}$ ". Build the box itself by butting, gluing, and nailing the joints, since they are hidden by the other members. Glue up the corners and round them.

Shape the foot rails and miter them around the ends and front, and set the corners on top. These may be glued and held until dry with clamps, or nails can be driven into them

from the inside of the chest.

Cut the upper and lower rails between the corners, finishing the panels with quarter-round molding, and sand the sharp corners until distinctly rounded.

The lid has a nosing band mitered around the front and ends. Give it about  $\frac{1}{8}$ " clearance over the chest lip, which is merely the  $\frac{3}{4}$ " projection of the box proper, and hinge it with three hinges screwed to the back. A tray may be added, if desired.

Colored sealing wax or stick shellac, melted and mixed to match the cedar tint, is a useful filler for holes.

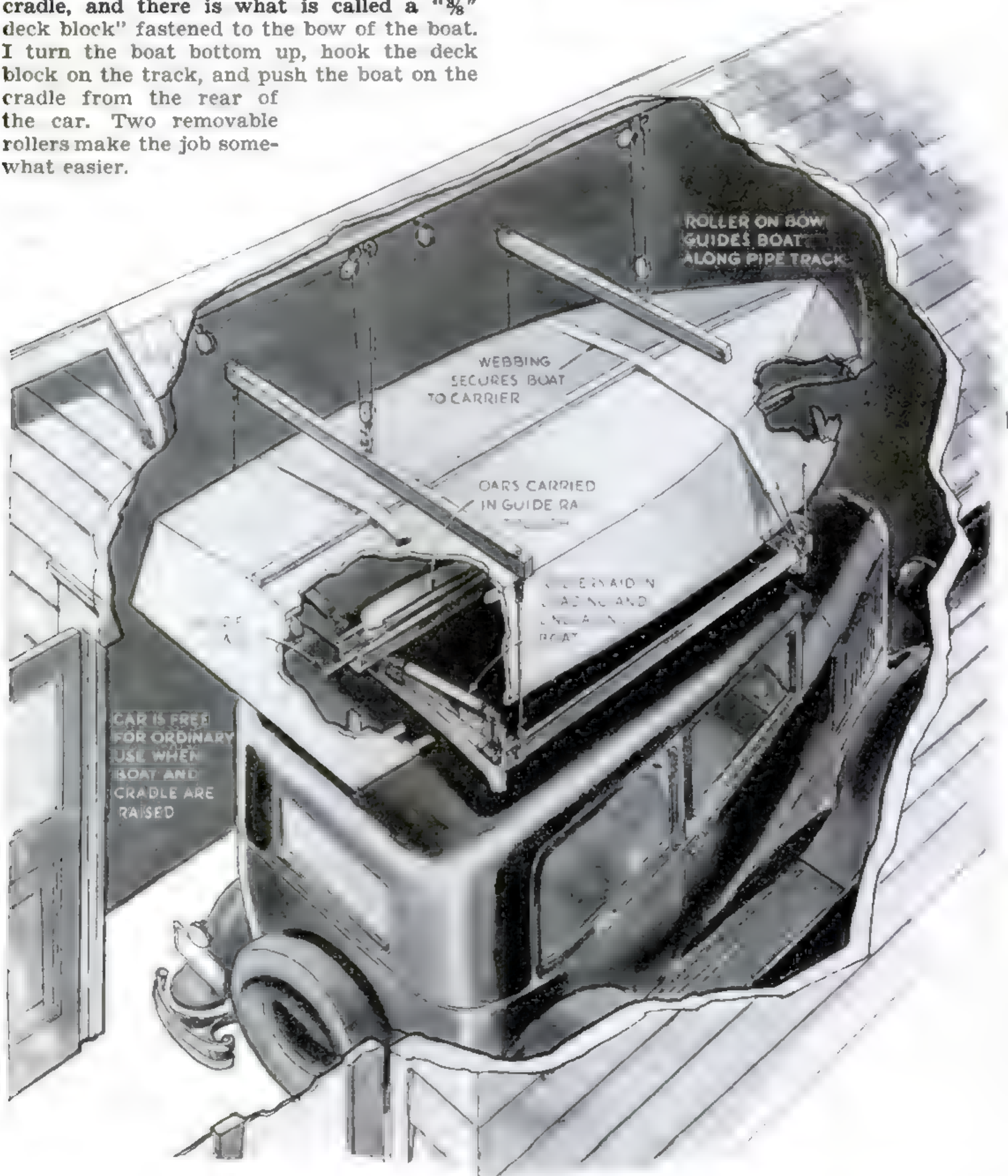
*For methods of finishing cedar chests, see P.S.M., Jan. '39, p. 180.*



# Boat Rolls Up on Cradle

**A**FTER building the POPULAR SCIENCE camper's utility boat, which proved to be a "corker," I devised the cradle illustrated for carrying it on top of a car. A track runs through the center of the cradle, and there is what is called a "3/8" deck block" fastened to the bow of the boat. I turn the boat bottom up, hook the deck block on the track, and push the boat on the cradle from the rear of the car. Two removable rollers make the job somewhat easier.

The wooden crosspieces of the cradle are cut to the contour of the car roof and padded on the underside. The track is a length of 3/8" pipe fastened in the center of the trough





# Lashed to Car Roof

with 1½" wood screws, well countersunk. Before installing the track, I flattened it slightly by laying it on a nearby railroad track and pounding it with a mallet. The bend in front was made, in the absence of a pipe vise, by sticking the end of the pipe through one of the holes in a manhole cover in the middle of the street and gradually shaping the pipe with the aid of a bending bar. The purpose of the bend is to clear the breasthook of the boat; furthermore, when the wheel runs off the track, the boat is just where it should be on the cradle for transportation.

The oars are stowed and tied in the troughlike track frame, one blade to the front and the other to the rear. They wedge in nicely.

The boat sheer rests on the 1" blocks marked A at all four corners of the cradle, and the blocks B keep the boat centered and prevent it from sliding. The large screw eyes are used to lash the cradle to the car and the boat to the cradle. They also serve in another way. When the boat is not needed,

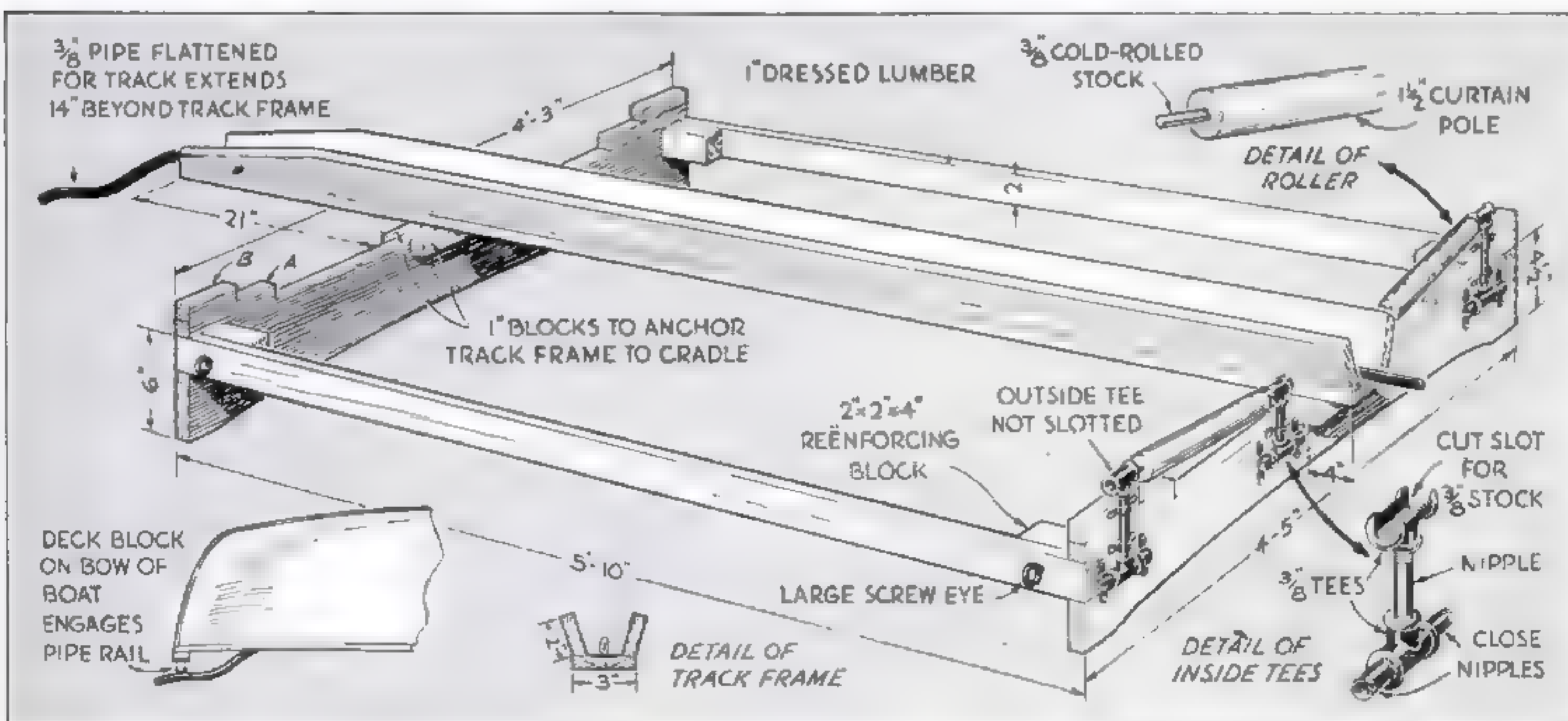
By  
**FRANK  
BAYER**



A man and a boy can raise the boat easily because the cradle has a lengthwise track to guide it straight and two removable wooden rollers

I use a pulley rig in the garage with which to hoist the boat, cradle and all, up to the ceiling. Then the car is driven out from beneath.

Of course, the cradle shown was made with one particular boat in mind and dimensions may have to be changed for a different boat.



How the cradle is built. Note that the rear crosspiece is 2" longer than the front one. When the boat is in place, the rollers are removed by lifting one end from the slotted pipe tee and pulling out the other

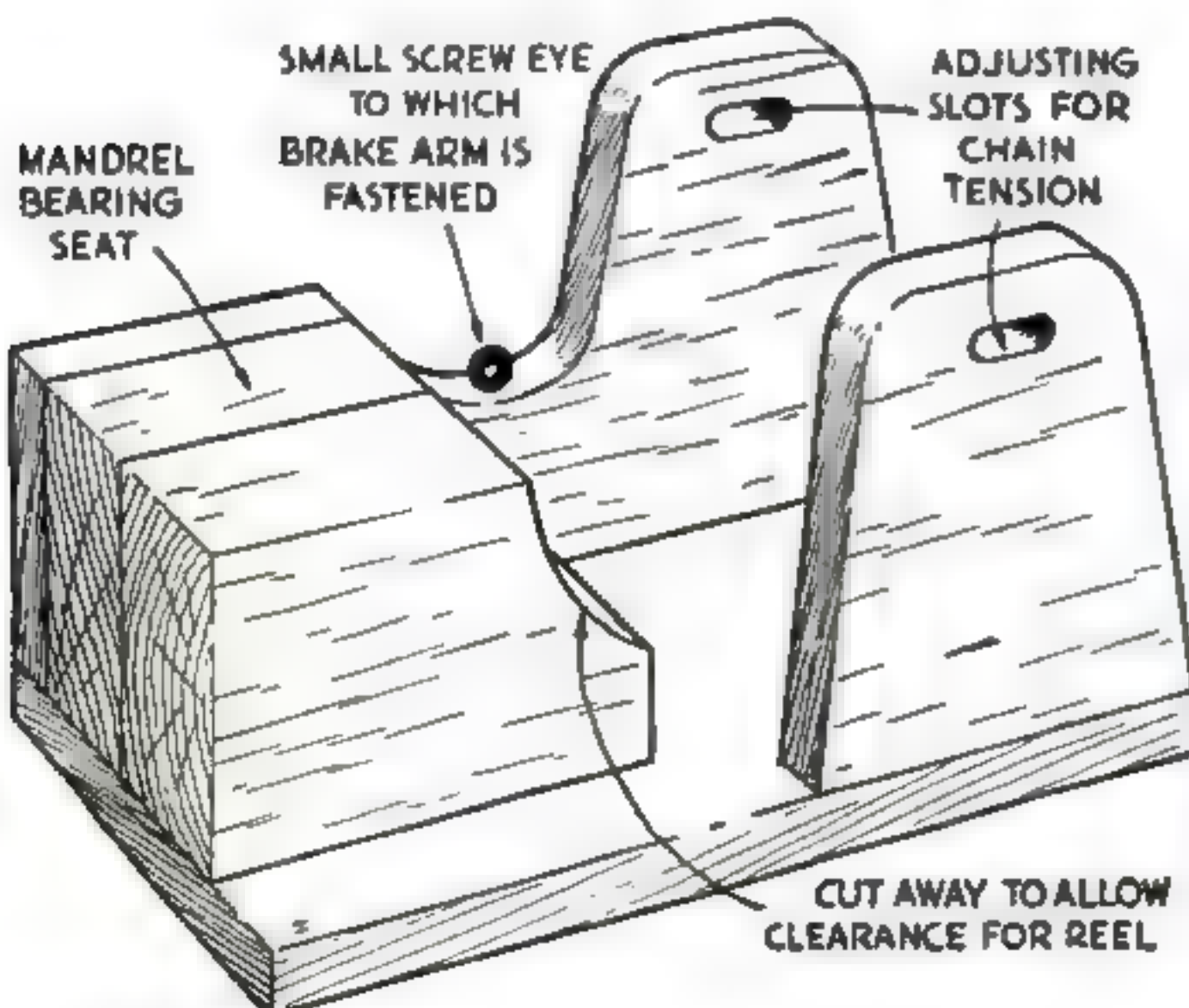
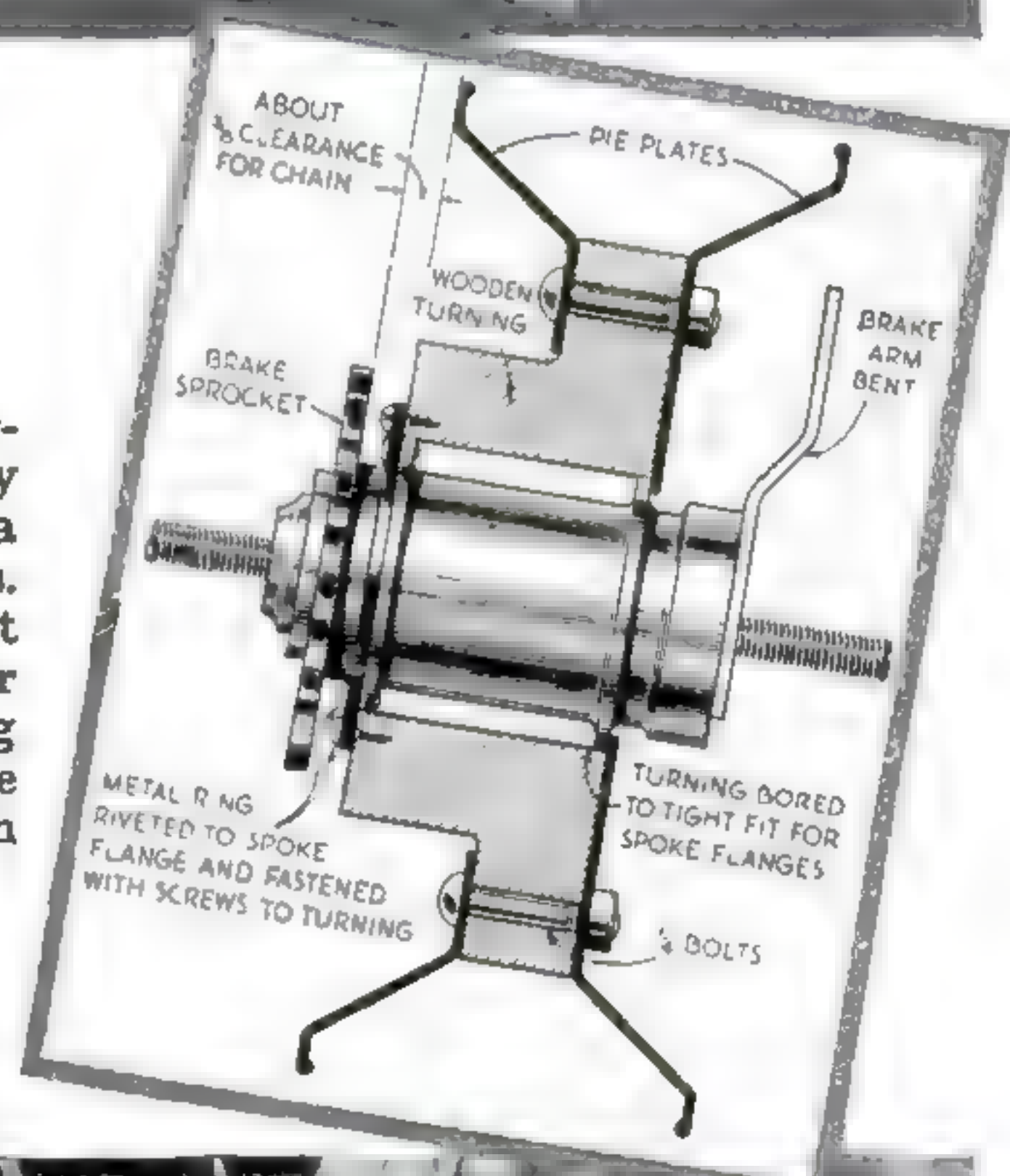


# High-Speed Reel

## BUILT FROM OLD BICYCLE PARTS



**F**OR either trolling or kite flying, this coaster-brake reel is very fast in action. The reel may be made in various sizes. The reel shown is a large one and makes use of 9" aluminum pie plates. When smaller plates are used, the sprocket that drives the reel should be from one of the smaller bicycles. The shaft and bearings for the driving sprocket are adapted from a small mandrel. The shaft is cut off to the correct length and held in place with collars.—HOWARD R. HEYDORF.





# Philanthropic Craftsman

## GIVES AWAY 3,000 TOYS A YEAR

A VISIT to the homeworkshop of W. D. Robinson, of West Helena, Ark., would lead you to believe that you had stepped into a small toy factory. Doll cradles are piled high along one wall, hundreds of wagons line the shelves that reach from floor to ceiling, and boxes of partially completed projects fill almost every available space. When the shop becomes too crowded, the toys are packed up and sent to some nearby charitable organization for distribution among poor children. Then the

work of making toys starts all over again.

Robinson, who works in a local mill, began this leisure-time activity over three years ago. The first year he made 2,000 toys; the second years, 2,500; last year, 2,940. In 1939 he hopes to go way beyond the 3,000 mark. The wood is donated by the mill, which is glad to encourage the philanthropy.

The Helena Homeworkshop Club, an affiliate of the National Homeworkshop Guild, is proud to claim Robinson as a member. The other members also make toys in their spare time, but so far they have not begun to approach his record.

To promote the home workshop hobby in *Muskegon, Mich.*, the Lakeside Homeworkshop Club is making jig-sawed signs to be placed in the windows of hardware dealers. Handbills giving complete information about the club have been distributed. Two recent meetings have been devoted to a demonstration of tool



W. D. Robinson, of the Helena (Ark.) club, and his son with some of the toys he presents to poor children

making on the metal lathe by Carl Stargardt. Harry D. Thompson exhibited some of his sand-dune landscapes at another meeting.

Floor lamps and tables are being made by the Tri-City Homeworkshop Club of *LaSalle, Peru,* and *Oglesby, Ill.* . . . Members of the South Shore Homeworkshop Club, *Quincy, Mass.*, have been able to raise considerable money by making and selling the sailboat whatnot shelves designed by a New Bedford Guildcrafter (see *P.S.M.*, Nov. '38, p. 198). The club's second anni-

versary was celebrated at a Boston night club to which the members took their wives . . . R. I. Bostwick demonstrated how to cut threads on a bolt when the *Vicksburg (Miss.)* Homeworkshop Club met at the home of W. H. Rodgers. A motion picture, "The Benefactor," was shown . . . The *Villa Park (Ill.)* Craftsman Club is fortunate in having three manual training teachers among its members: Lawrence Braaton, W. A. Fritts, and L. J. Miller. Mr. Miller spoke before the National Vocational Guidance Association at its last convention in Cleveland . . . The Emmanuel Hand-Craft Lodge of *New York City* is sponsoring a group of junior craftsmen . . . A quiz on shop tools and materials caused considerable amusement when the Klondike Homeworkshop Club of *Masontown, Pa.*, met at the shop of Jennings B. Christopher.

The *Regina (Sask., Canada)* Homeworkshop Club visited the shop of W. Lazenby, who demon-



Official Magazine  
POPULAR SCIENCE  
MONTHLY

## NEWS OF THE NATIONAL HOMEWORKSHOP GUILD





Kerrisdale Homeworkshop Club of Vancouver, B. C., Canada, in the shop of Ian B. Mackay making toy wheelbarrows. The work received praise from a local newspaper recently

strated his 6-volt cadmium-plating equipment. A cadmium-plated brass button was given to each member as a souvenir. Mr. Lazenby also exhibited a lighthouse lamp he had just completed. A mimeographed magazine, "Splinters," is published each month by the club.

Ralph L. Jenner showed pictures taken during his trip to Australia at a meeting of the *LeRoy (N. Y.)* Homeworkshop Club. Joseph Kibler has been appointed chairman of the fourth annual display contest.

The *Nutley (N. J.)* Homeworkshop Guild held its first exhibit in connection with a homecraft display at the Belleville Reformed Church . . . Easter toys were distributed to three dozen poor children by the Bison Builders Guild of *Buffalo, N. Y.* . . . Stanwood W. Skolfield demonstrated saw filing before the *Brunswick (Me.)* Homeworkshop Club . . . The Capital Homecraft Club of *Washington, D. C.*, is assisting local welfare organizations in the rehabilitation of toys. Several members attended the annual model railroad show in New York City . . . Bookcases, desks, and tables are being made by the *West Haren (Conn.)* Homeworkshop Guild . . . A local merchant has donated a meeting room for the *Mt. Gilead (Ohio)* Homeworkshop Club . . . The *Conneaut (Ohio)* Homeworkshop Club plans to have a pocket booklet printed containing the constitution, by-laws, and list of members' addresses . . . More than 1,000 toys were made in 1938 for distribution to poor children by the *Louisville (Ky.)* Homeworkshop Club, which hopes to do even better this year . . . W. L. Hagen demonstrated leather and metal crafts before the *Springfield*



Ernest Deford, a member of the Saginaw (Mich.) Homecraft Club, using a jig saw in the club shop

(*Mass.*) Homecraft Club . . . The *Denver (Colo.)* Homeworkshop Club will hold its annual exhibition in connection with the Y. M. C. A. hobby circus in May.

In recognition of his work as program chairman, the Union County Craftsman's Guild of *Elizabeth, N. J.*, recently dedicated one of its meetings to M. M. Hatten. There was



a distribution of gifts in a ceremony which the club calls its annual hobby tree.

The following articles were displayed by members at a meeting of the *Edmundston (N. B., Canada) Hobbyists Club*: inlaid table, William Landry; double-deck table, O. April;

smoking stand and lamp, F. Nadeau; book ends, G. Therriault; and bedside table, R. C. Flewwelling.

Fifteen prizes—seven firsts, five seconds, and three special awards—were captured by the *Timbercraft Homeworkshop Club, New Bedford, Mass.*, with its display at a local hobby show. There were sixty-five projects in the display, which was the largest of its type. Those receiving awards were Charles Jeglinski, Adolph Wiater, Adalard Richard, Frank Ormond, Chester Wypych, Walter Modesto, and Arthur Fournier. Members of the Plymouth, Fall River, and New Bedford home workshop clubs attended.

Henry J. Jung has been appointed to arrange a picnic in June for the *Hardwood Homeworkshop Club, Neenah, Wisc.*



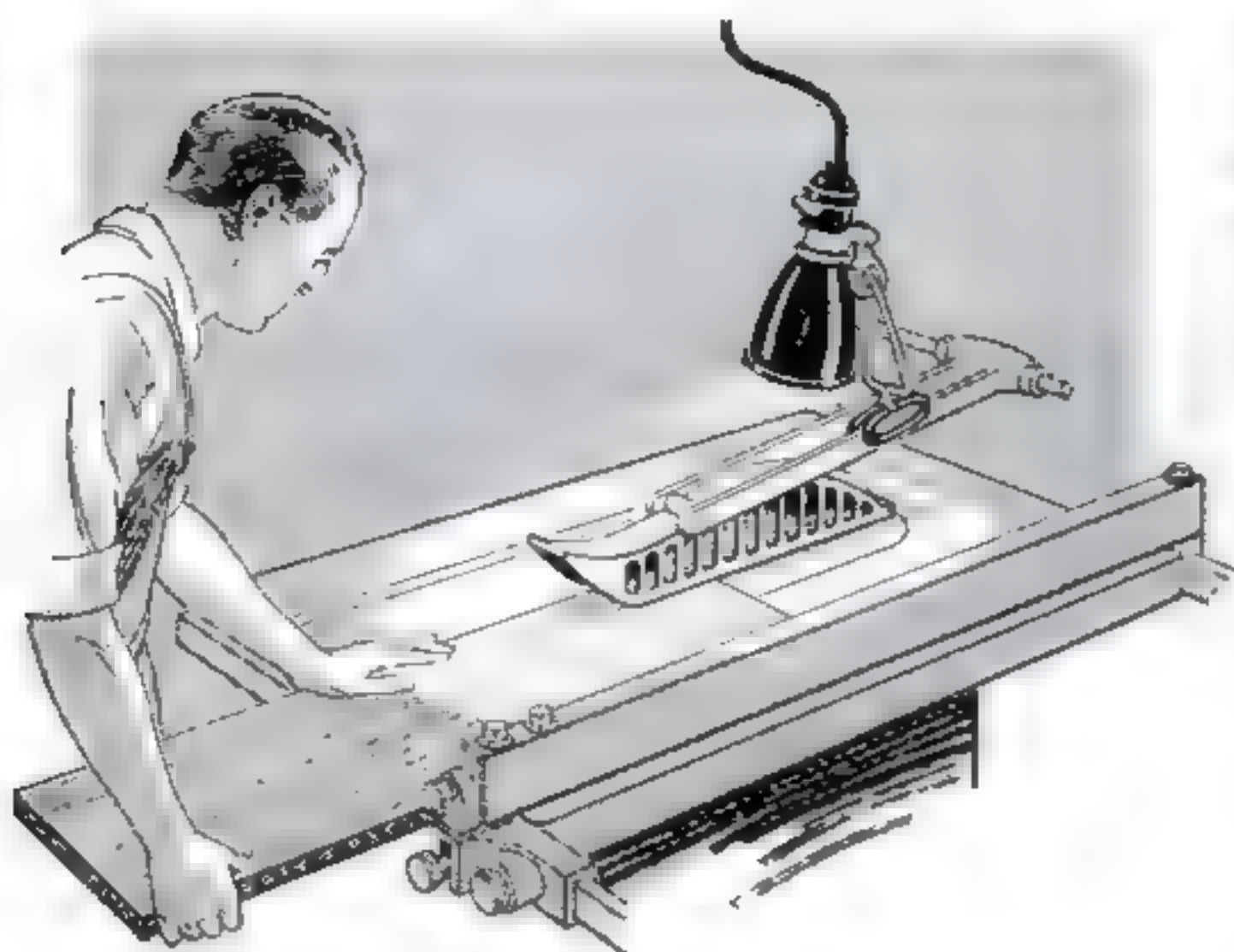
Danville (Ill.) club in the shop of C. R. Reed. Seated at the left is Dr. A. R. Brandenberger, president



Members of the Peekskill (N.Y.) Homeworkshop Club, who enjoyed a demonstration in the large workshop of Arthur A. Dix on how to glue up veneer panels. The speaker was Albert Constantine, Jr., of New York City



# Small Clamp-on Lamp Illuminates Circular Saw



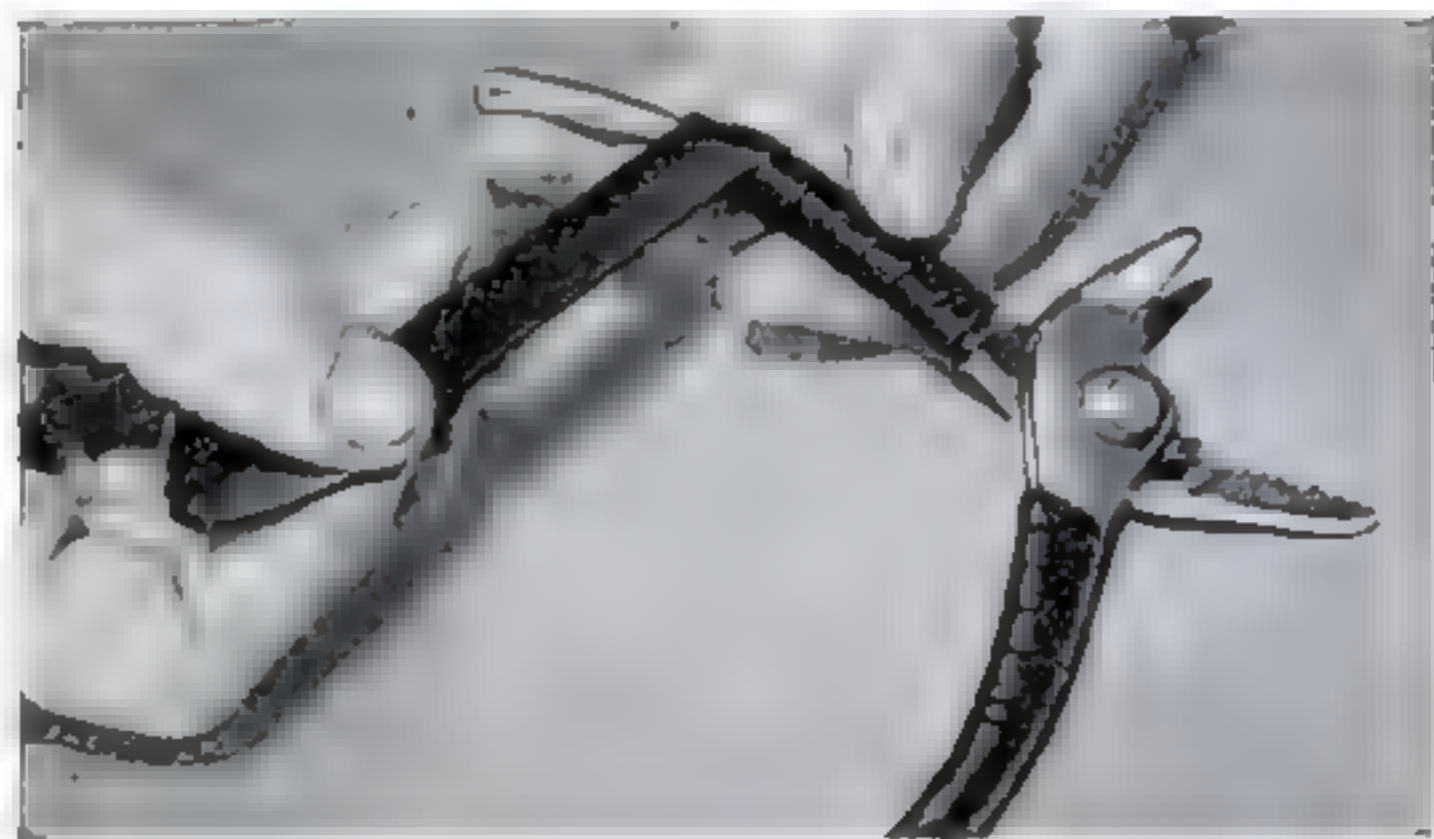
**C**IRCULAR saws, although the most frequently used machines in the home workshop, usually lack the special lamp attachments provided with many other types of power tools. This drawback may be overcome by using a clamp-on style of lamp, which may be attached to the saw guard or even to the edge of the table when required. The lamp consists of a regular key socket and a slip-joint canopy from an old lighting fixture, which is used for the shade. To the socket is attached a photographer's clamp-on fixture.—E. A. BOWER.

## Starting Difficult Screws

SMALL screws that must be started in awkward places may be held on the end of a screw driver in the manner shown. The



screw driver is set in the slot of the screw, and the two are taped together with cellulose mending tape. The greater width of tape is placed on the screw driver so that the tape will come off the screw easily after the screw has been driven into position.—H. R. H.



## Pliers Wound with Rubber

WHEN it is necessary to work with heavy wire or hard materials, it pays to pad the pliers handles with  $\frac{3}{4}$ " by 9" strips of vulcanizing tire-patch material. The ends are pinched together and held with a clothespin while being vulcanized for fifteen minutes in an ordinary oven at very low temperature.

## LEATHER BOOKBINDINGS

[FORMULAS]

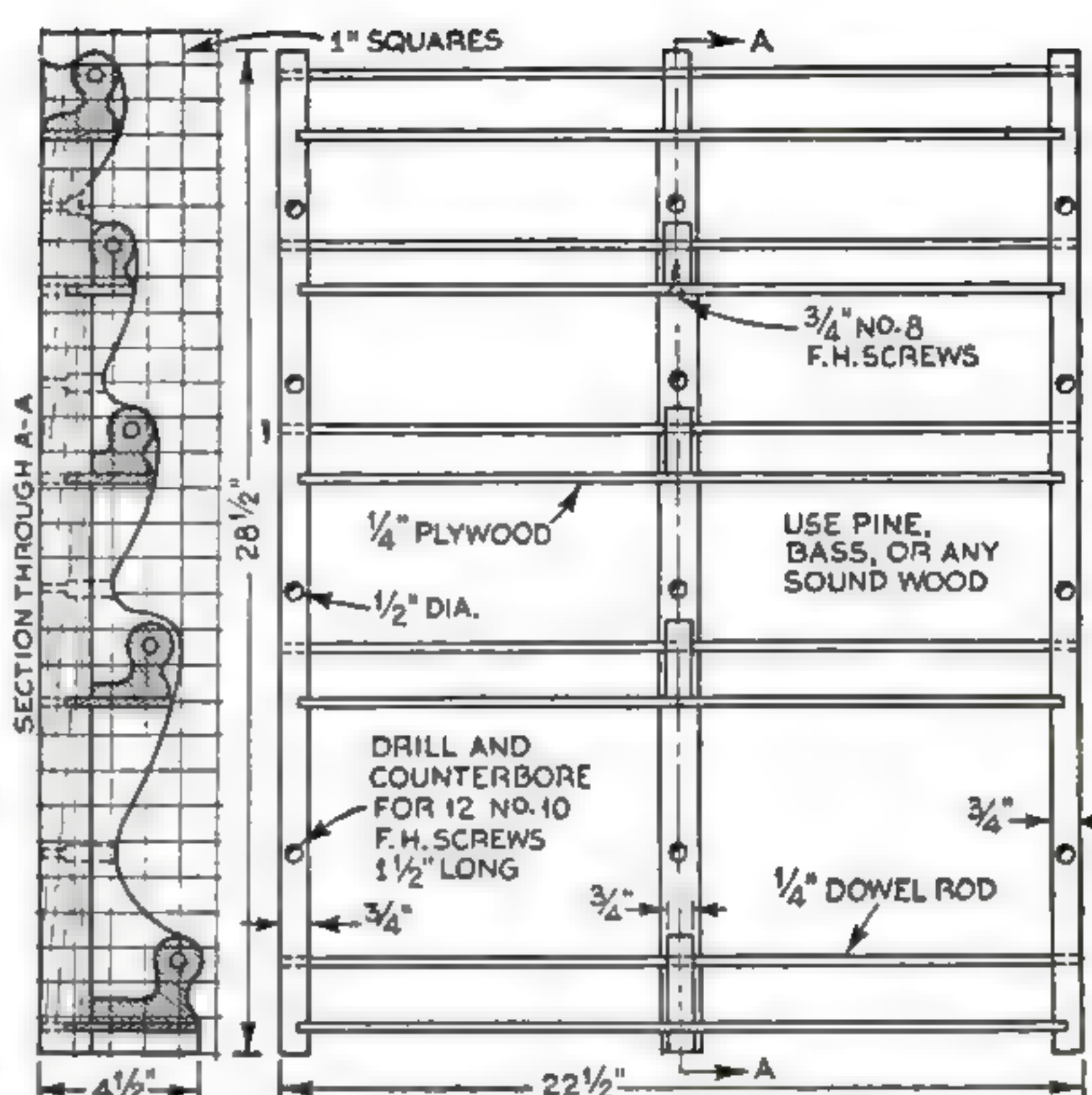
Genuine leather bookbindings may be preserved from deterioration and kept in first-class condition by applying the following dressing:

|                                  |        |
|----------------------------------|--------|
| Adeps lanae, anhydrous (lanolin) | 1 part |
| Neat's-foot oil                  | 1 part |

Mix the two thoroughly until the composition is of uniform consistency. Apply with a brush, then polish with a soft cloth or a lamb's-wool polisher of the kind used for shoes. In the case of old books, where the leather has lost its life, this treatment will not restore the binding, but it will check further deterioration.

POPULAR SCIENCE MONTHLY SHOP DATA FILE





How the rack is constructed. Dimensions may be modified to suit the door to which it is to be fastened, as at the left

## Spice Rack Fastened Inside Kitchen-Cupboard Door

IF A RACK like the one illustrated is made for a kitchen-cupboard door, it will save time in selecting spices, flavorings, and other cooking essentials. Since the rack protrudes within the cupboard, the regular shelving will have to be reduced in depth. Both end pieces are cut at once from  $\frac{3}{4}$ " stock and grooved for  $\frac{1}{4}$ " shelving. Drill the holes for the  $\frac{1}{4}$ "

dowels at the same time, and drill and counterbore for the screws for fastening the rack to the door. A strip approximately  $1\frac{1}{4}$ " by  $1\frac{1}{2}$ " is used to support the shelving at the center. Notch this strip and the shelving so that they will slide together. Cut some small additional supports for the dowel rods at the center.—EDMUND C. HANLEY.

### DIMENSIONS OF TYPICAL TABLES

#### [FURNITURE]

| Type            | Description  | Width             | Length | Height |
|-----------------|--|-------------------|--------|--------|
| Bedside table   | One drawer, turned column  | 15"               | 19"    | 27"    |
| Butterfly table | Each leaf $10\frac{3}{4}$ "; round top   | 34"               | 34"    | 24"    |
| Card table      | Square or round, hinged top  | 36"               | 36"    | 30"    |
| Coffee table    | Rectangular or oval top  | 18"               | 26"    | 18"    |
| Console table   | Half-round top   | $12\frac{1}{2}$ " | 28"    | 32"    |
| Dining table    | Oval with turned column; seats six   | 36"               | 52"    | 29"    |
| Dressing table  | Rectangular top, three drawers and mirror  | 20"               | 36"    | 30"    |
| Drop-leaf table | Each leaf $5\frac{1}{2}$ " by 27"; rectangular top 17" wide                                    | 28"               | 27"    | 28"    |
| Drum table      | Round with apron, turned column  | 26"               | 26"    | 27"    |
| End table       | Rectangular with book trough   | 14"               | 21"    | 24"    |
| Gate-leg table  | Oval, each leaf $12\frac{1}{4}$ " by 32", top $3\frac{1}{2}$ " wide, turned legs, trestle feet | 28"               | 32"    | 28"    |
| Lamp table      | Round top, turned column   | 18"               | 18"    | 27"    |
| Tilt-top table  | " " " "  | 26"               | 26"    | 28"    |
| Writing table   | 25" clearance for legs   | 26"               | 60"    | 29"    |

POPULAR SCIENCE MONTHLY SHOP DATA FILE



# More Pep FROM YOUR Outboard Motor

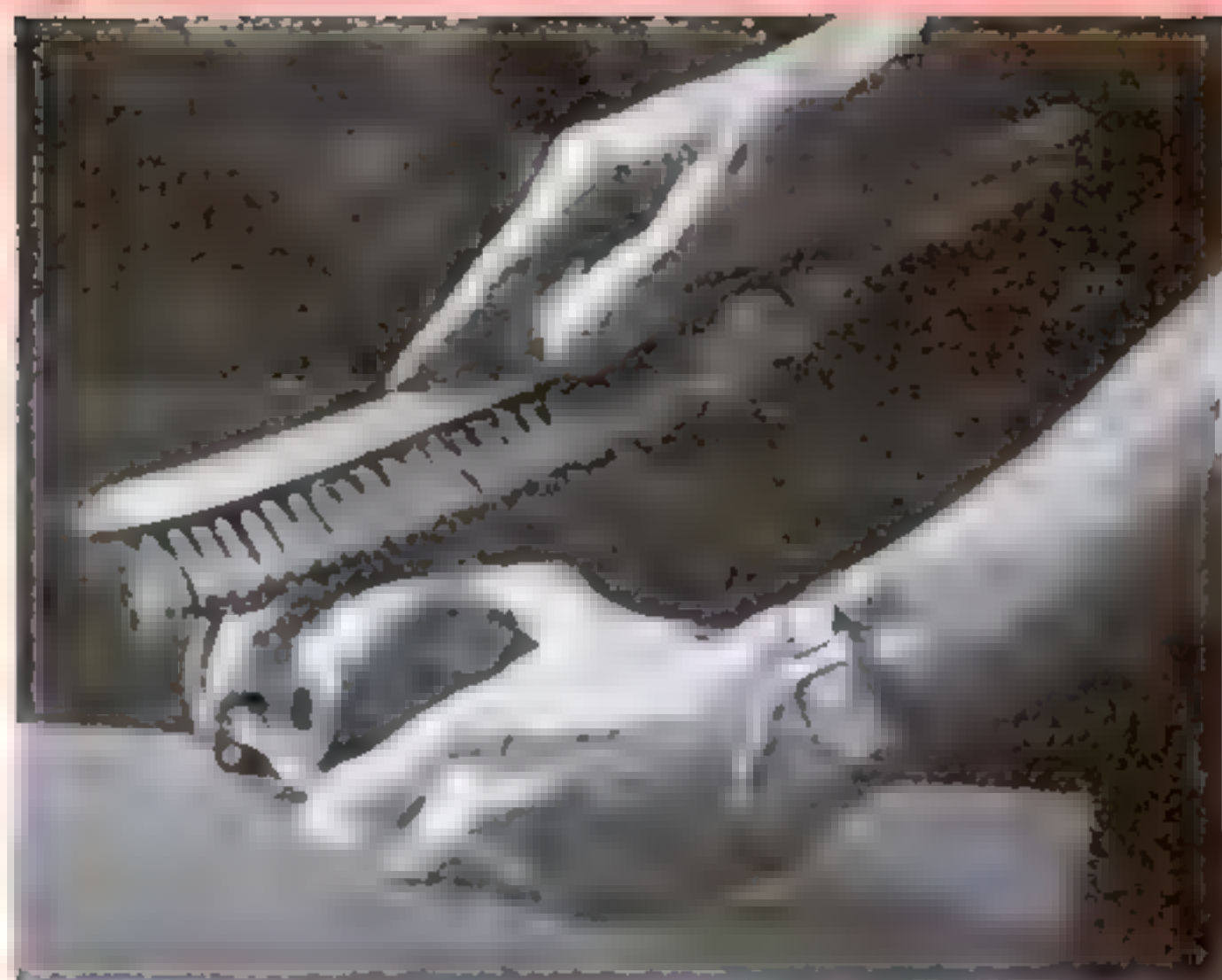


How to remove a flywheel without danger of straining the light crank webs and springing the crankshaft

**A**LTHOUGH the average outboard motor is very well made and requires little attention other than proper lubrication, it is a high-speed machine and in time will require taking down and reconditioning.

The most difficult task is likely to be the removal of the flywheel because of the danger of springing the crankshaft. However, it may safely be done as illustrated. The clamps are set so as just to catch the rim of the flywheel and tightened up evenly; then the crossbar is struck a sharp rap with a medium-weight hammer. This method does not strain the delicate crank webs.

The cylinders may now be easily removed. They should be cleaned inside free of carbon deposit and wire brushed outside, then painted with



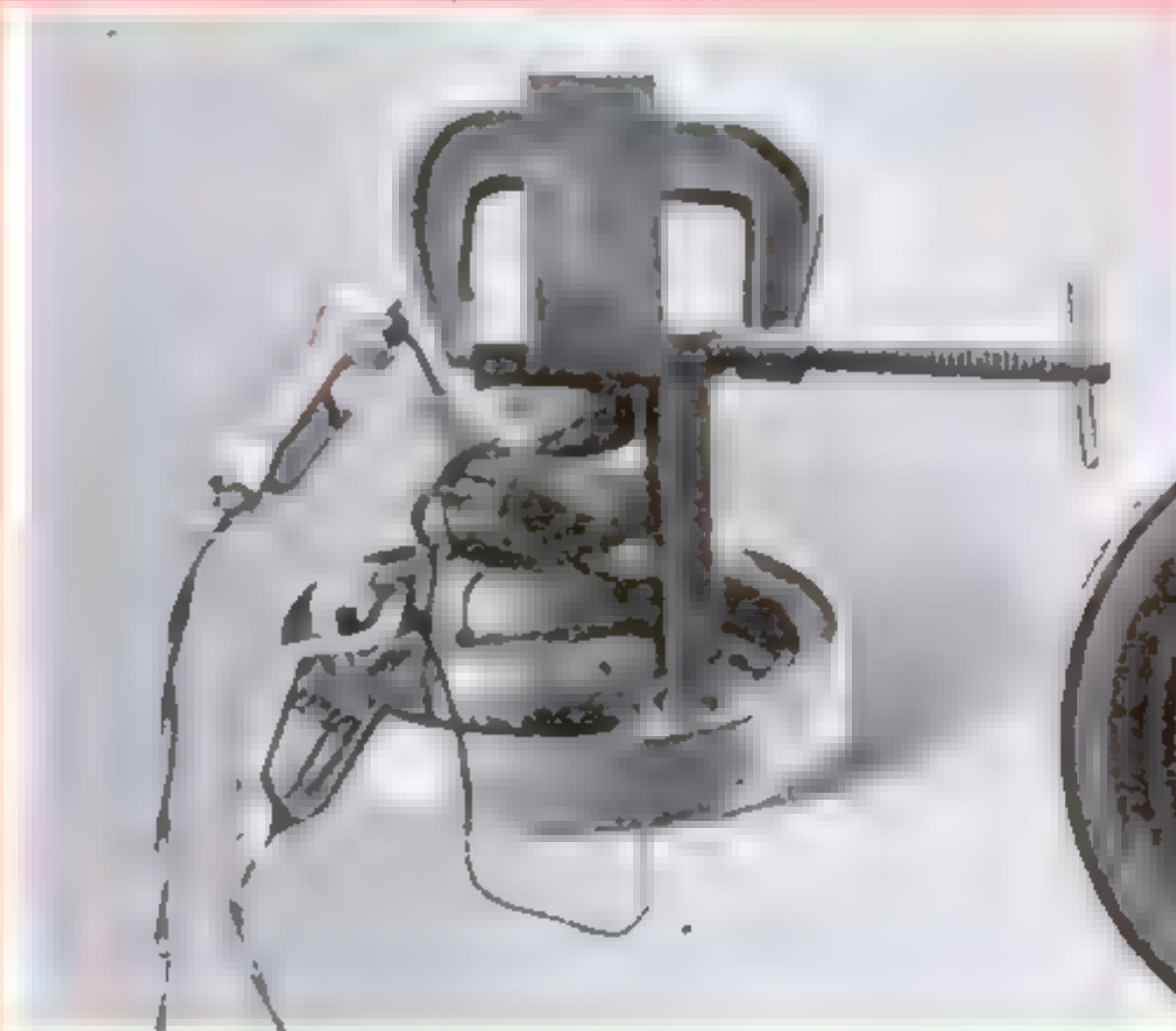
Clean all carbon deposits from the inside of the cylinders and give the outside a wire brushing

aluminum paint and given a coat of any good auto enamel.

Next remove the rings. If they are not stuck, they may be removed by slipping thin strips of tin can under them so they will slide off the piston. Should they be stuck and show black part way around, they should be discarded. In fact, if the ring sticks at all, it is probably worn out of true and should be replaced.

After the rings are removed, the ring lands or slots should be scraped clean. This may be done by cutting a strip of sheet iron the width of the land and scraping, but do not damage the sides of the lands as the power of the motor depends on the perfect seal the rings make with the lands and the cylinder wall.

Because of vibration and other causes, the magnet of the flywheel magneto often loses its magnetism, causing the motor to start with difficulty. A temporary recharging elec-



An improvised electromagnet for reviving the magneto. The small keeper is shown below







When perfectly clean, the cylinders are painted with aluminum paint and given a coat of enamel



If the rings are not stuck in the lands, they may be removed by slipping strips of tin under them

tromagnet may be made as shown by taking the fields from an old auto generator, connecting them in series so the current flows in the same direction through all the coils, then making a U-shaped core from some pieces of scrap iron bar, and holding them in place with a C-clamp. The coil, when connected to a 6-volt storage battery, forms a very powerful magnet. It is held so the ends of its iron core are about  $\frac{1}{2}$ " from the ends of the magneto magnet, and the current is turned on. The charging magnet will strike the magneto magnet a sharp blow as it is drawn to it, and it should be left in contact for a few seconds, when the current may be turned off and the charging magnet removed. A keeper, consisting of a small piece of iron, must be placed at once across the ends of the magneto magnet and left there until just before the flywheel is replaced.

Some outboards are hard to start, even with a magneto in perfect condition, because of the difficulty of spinning them against their high compression. In cases of this kind, a shorting switch may be placed so as to short one plug, which intensifies the spark in the other cylinder. The switch must be attached to the base of the plug.

Greasing the gear box is made easier if the plug is replaced with a standard pressure fitting and a grease gun is used. As the grease is pumped into the gear box, rock the flywheel back and forth.



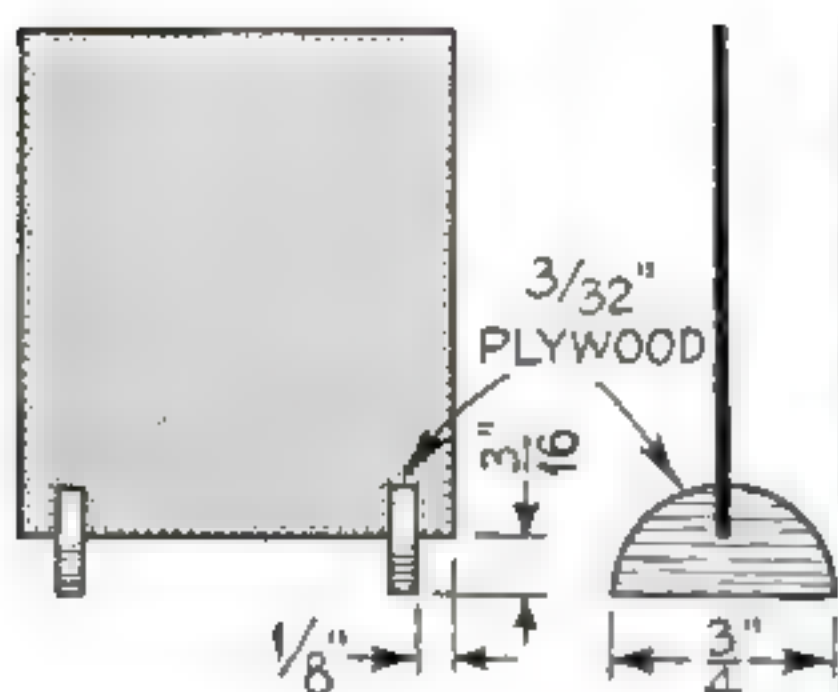
By W. C.  
CHENEY



Above, a shorting switch used to aid in starting. At right, grease-gun fitting for greasing the gear box



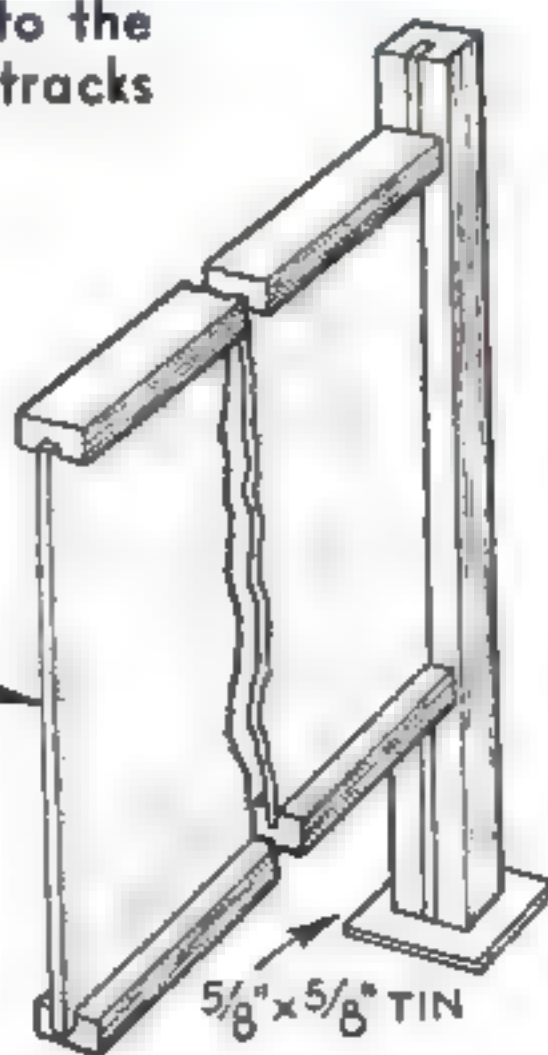
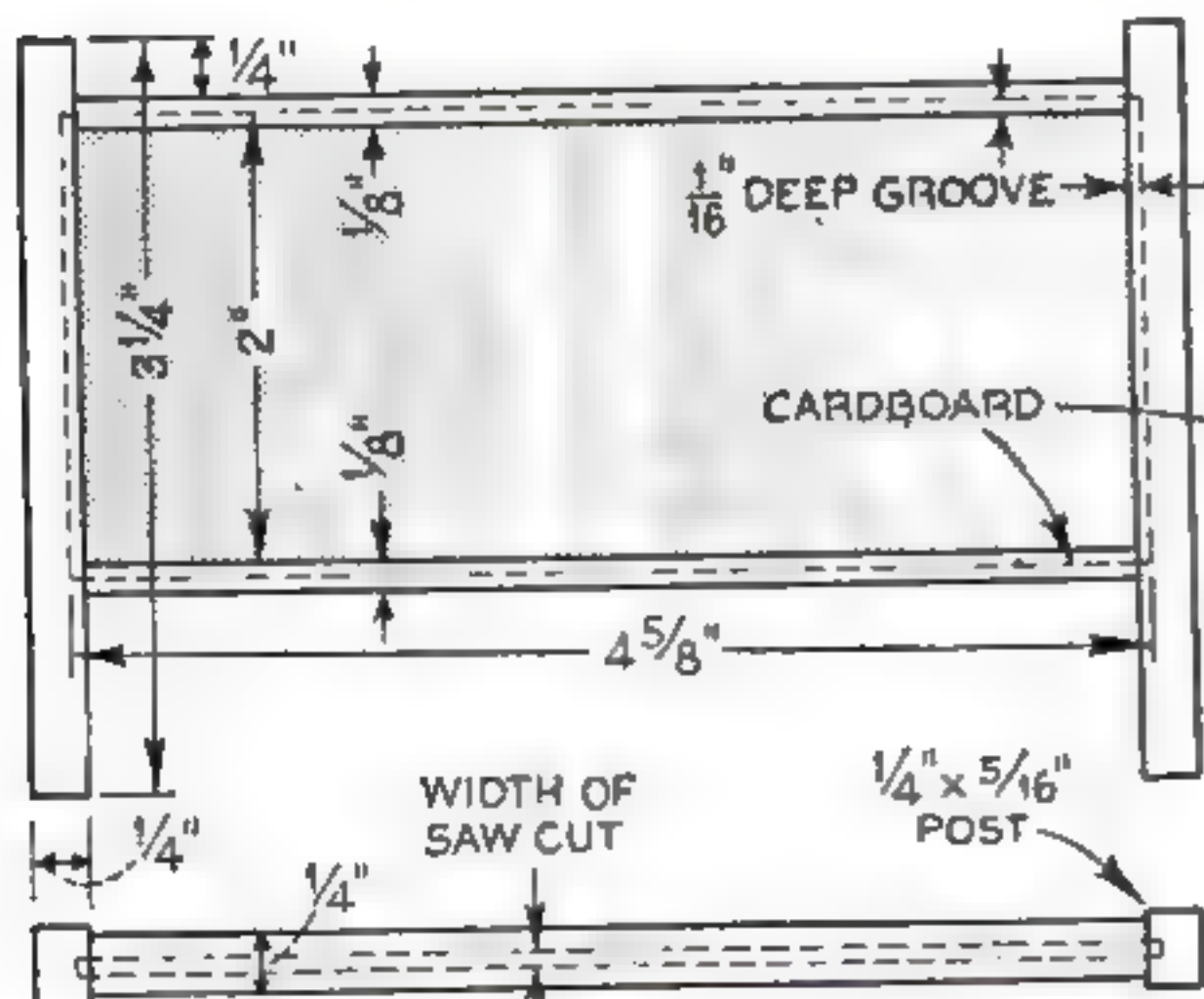




Colorful small posters to use on passenger-station platforms are made from suitable book-match covers



Along a highway, set billboards at an angle to the road, but elsewhere place them parallel to the tracks



How to construct billboards for an O-gaugerailroad

**S**CALED from actual structures, these billboards lend realism to a model railway, yet are easily constructed. Several of each type, placed at vantage points about the system, help to create an effective layout.

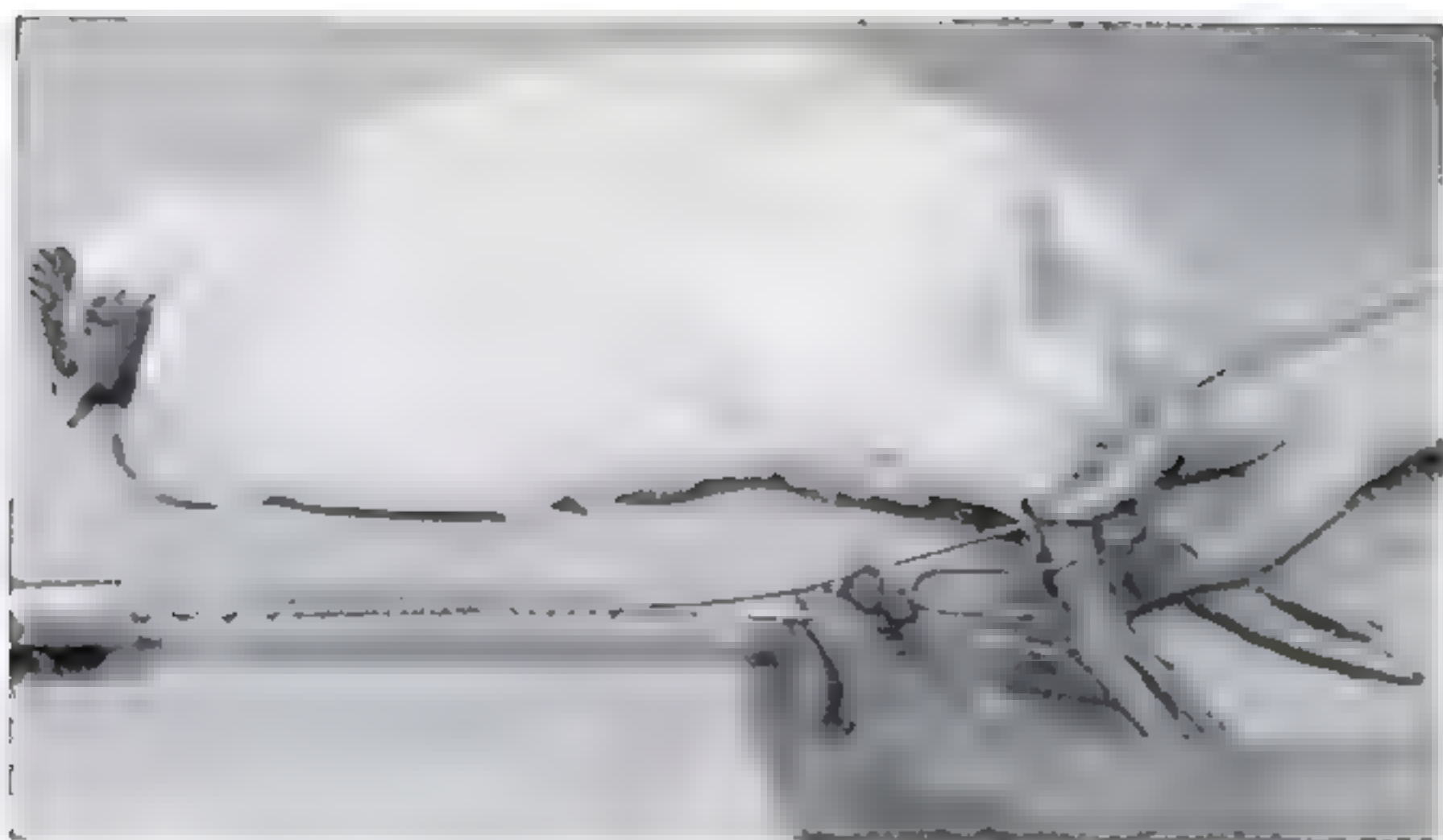
The dimensions indicated on the drawings are for an O-gauge railway.

From  $\frac{1}{4}$ " stock, rip out strips  $\frac{1}{8}$ " thick for the horizontal pieces and  $\frac{5}{16}$ " thick for the posts. Use a pusher stick to avoid accidents on the circular saw, and cut grooves  $\frac{1}{16}$ " deep in the center of each strip. Glue the posts to the side edges of heavy cardboard 2" by  $4\frac{5}{8}$ ", cut the top and bottom wood strips to fit snugly between the posts, and glue in place.

On the front of the cardboard, paste suitable advertising matter clipped from magazines, or, as in the illustration of the three finished billboards, take photographs of the advertising on real billboards, enlarge the picture to fit the space on the cardboard, and tint with water colors to match the original. Fill in the exposed ends of the grooves with crack filler and paint the wooden parts green. Square pieces of tin nailed to the bottom of the posts keep the billboards upright.

The small posters at the top of the page are made from book-match covers. Glue two sections of suitable covers together, back to back, and add the two half circles of thin plywood that serve as stands.—C. ELMER BLACK.





The wire is bent as at the left so that the spring-operated hook will lock the leg when caught in the fork

## Bent-Wire Catcher Locks Instantly on Leg of Chicken

WITH a single quick lunging motion, a chicken can be caught and securely held by means of this self-locking, bent-wire catcher. It is an improvement over a plain wire hook because it automatically grips the leg of the fowl when pushed in place. The catcher should be made from 20-gauge spring wire such as may be obtained from coil springs taken from an old automobile cushion. Bend

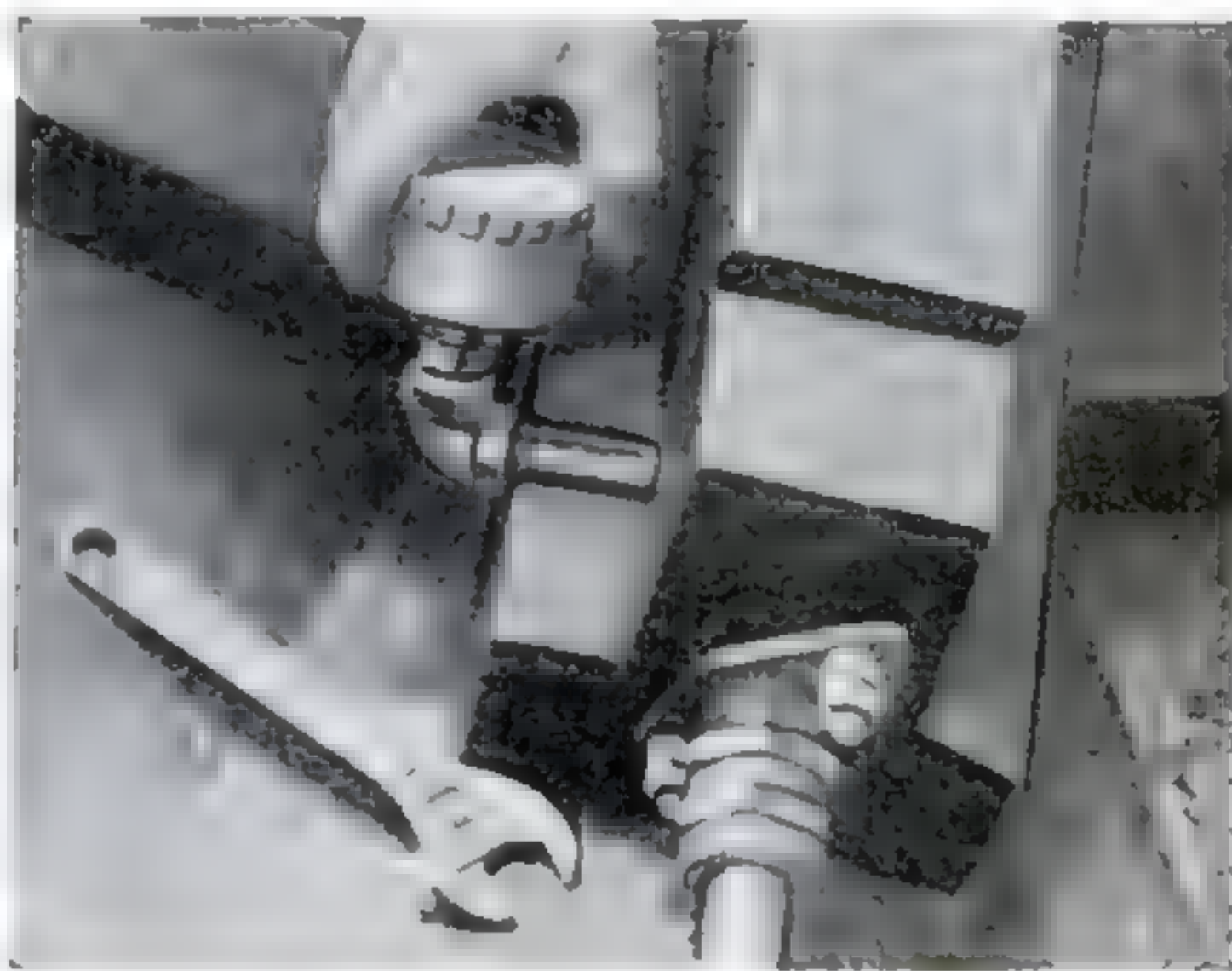
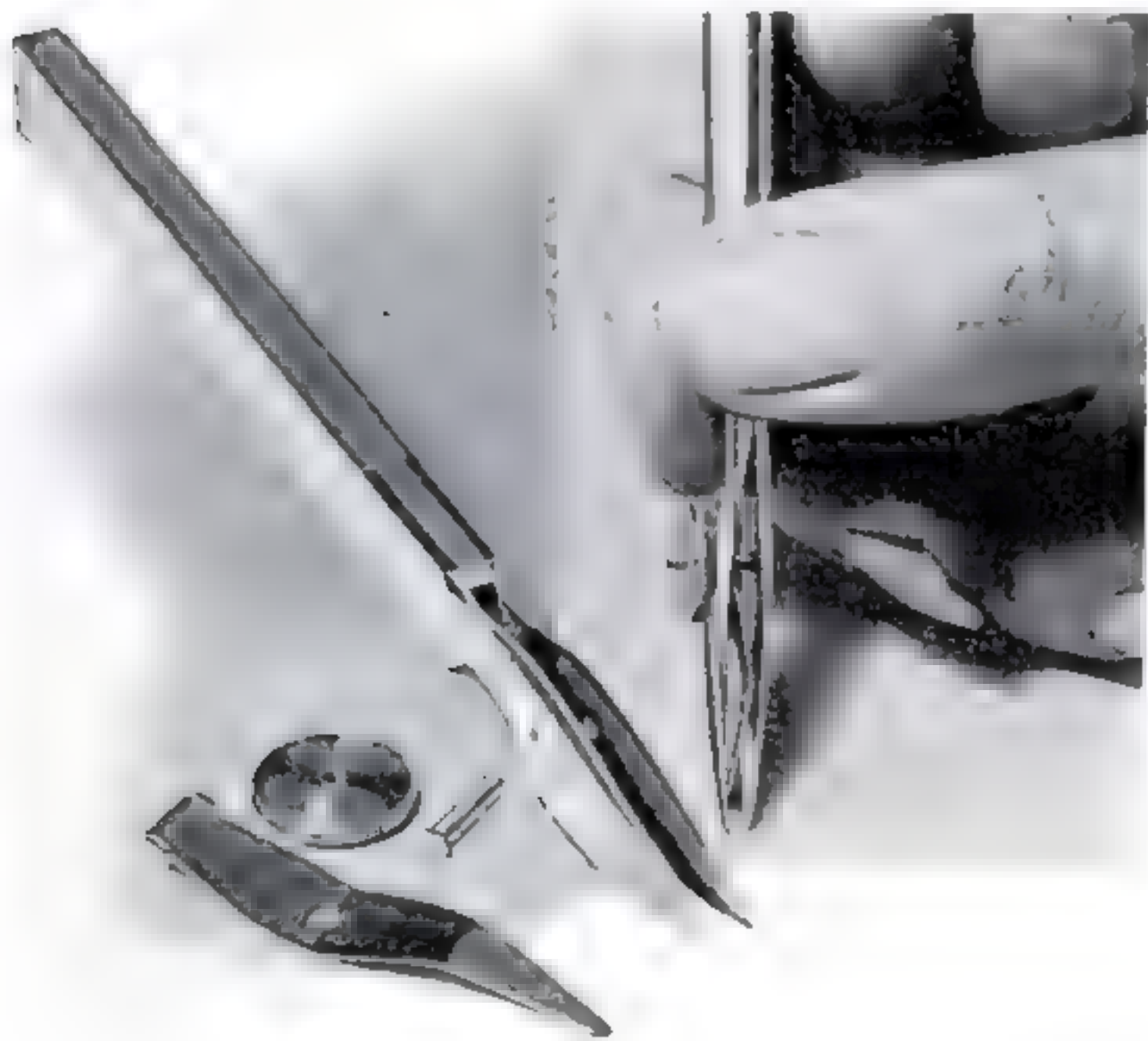


A chicken is captured and held by pushing the forked end of the catcher against a leg

the wire as shown, wrap the straight ends with a tight coil of wire, and insert in an old broom handle.—BENJAMIN NIELSEN.

## Ink Holder for Ruling Pen

IN USING a large ruling pen on long, heavy lines, a draftsman is apt to overload his pen and cause a blot. This may be prevented by fitting a thin metal tongue between the pen nibs. The tongue may be cut from thin brass shim stock, obtainable at any auto repair shop. The point should be about  $\frac{1}{8}$ " shorter than the pen points and have two small ears as shown below.



## Greasing the Stern Bearing of a Small Motor Boat

A CONSTANT supply of grease can be fed into the stern bearing and also the stuffing box of a motor boat by using a good-sized grease cup, an elbow, and a pipe nipple. Drill the hole through the side of the shaft log into the shaft hole a trifle small, and screw in the nipple; then add the elbow and the grease cup as illustrated above. Use a soft grease and tighten the cup as often as you find necessary.—ARNE O. SALONEN.





# SPLIT-IMAGE Range Finder

## INSURES ACCURATE FOCUSING

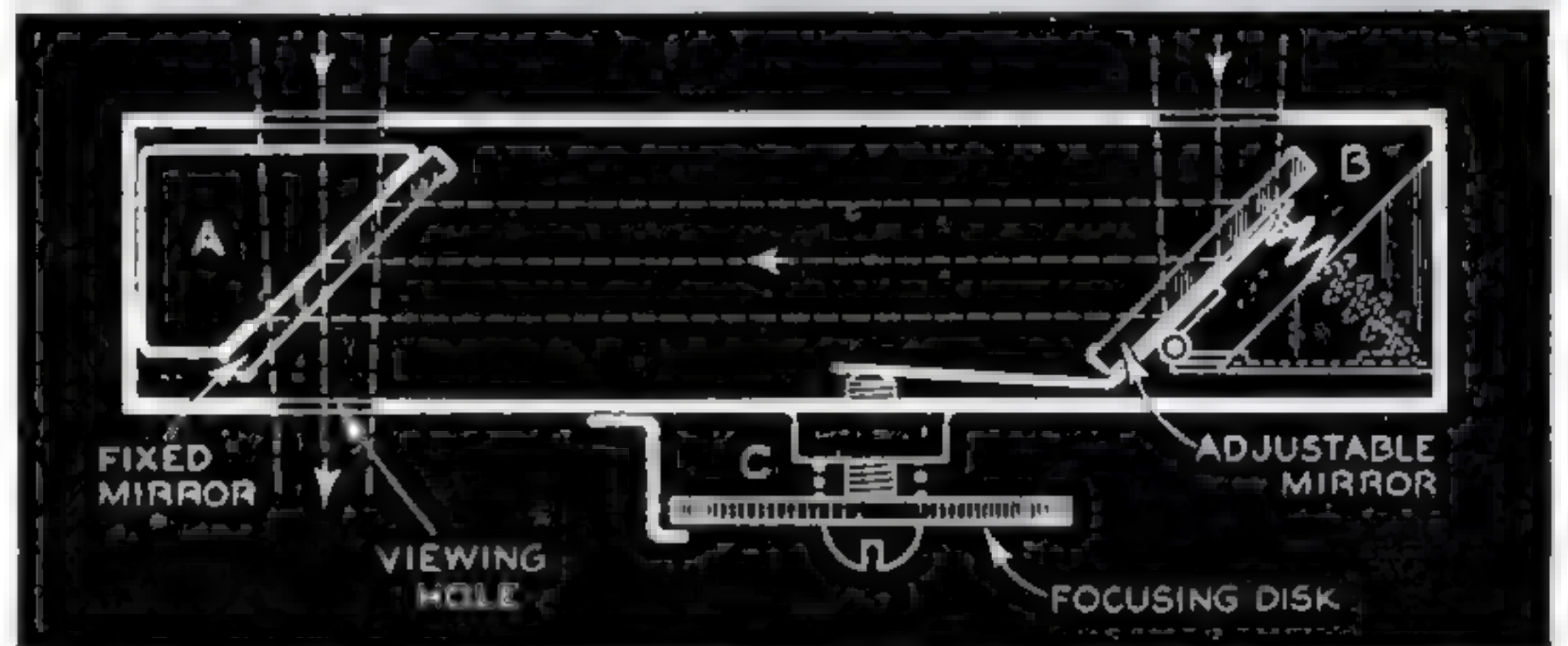
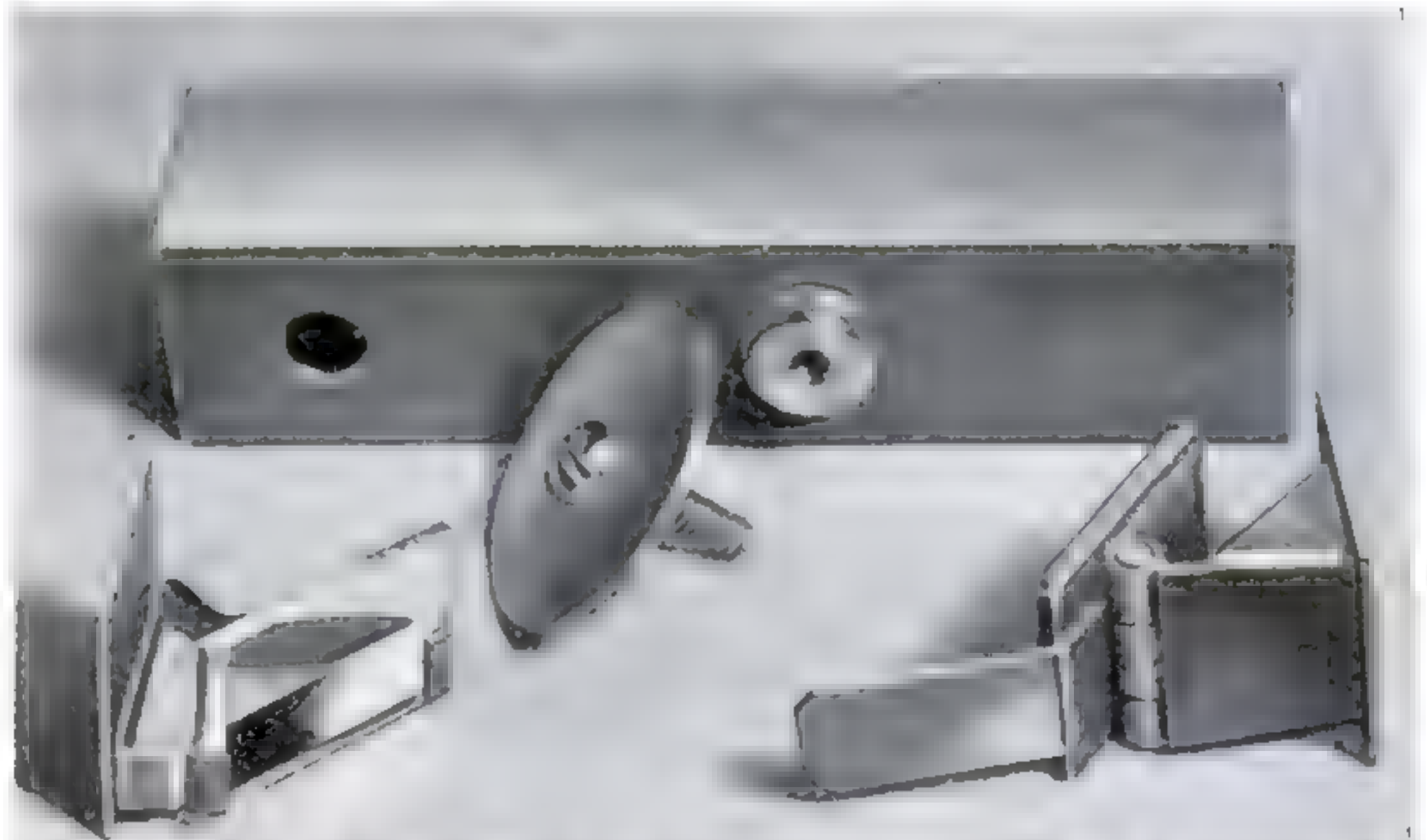
By  
**RALPH L.  
ASBURY**

**T**HOSE much-wanted photos that turn out fuzzy from poor focusing have proved to most amateurs that they are none too good at guessing distance. This trouble may be remedied by the use of an easily made range finder of the split-image type, the optical principle of which may be seen in the accompanying drawing.

The materials necessary are a piece of square brass tubing, a little thin sheet brass, a small hinge, a machine screw and nut, a couple of small springs, and a vanity mirror.

The brass tube, which was salvaged from a discarded chandelier, is  $\frac{3}{4}$ " square and  $3\frac{1}{4}$ " long. On one side a  $\frac{1}{4}$ " hole is drilled  $\frac{1}{2}$ " from the end of the tube. On the opposite side two  $\frac{5}{16}$ " holes are drilled, one directly opposite the  $\frac{1}{4}$ " hole and the other  $\frac{9}{16}$ " from the other end. Two square end pieces are next cut slightly larger than the ends of the tube. The excess metal is filed off after the mirrors are adjusted.

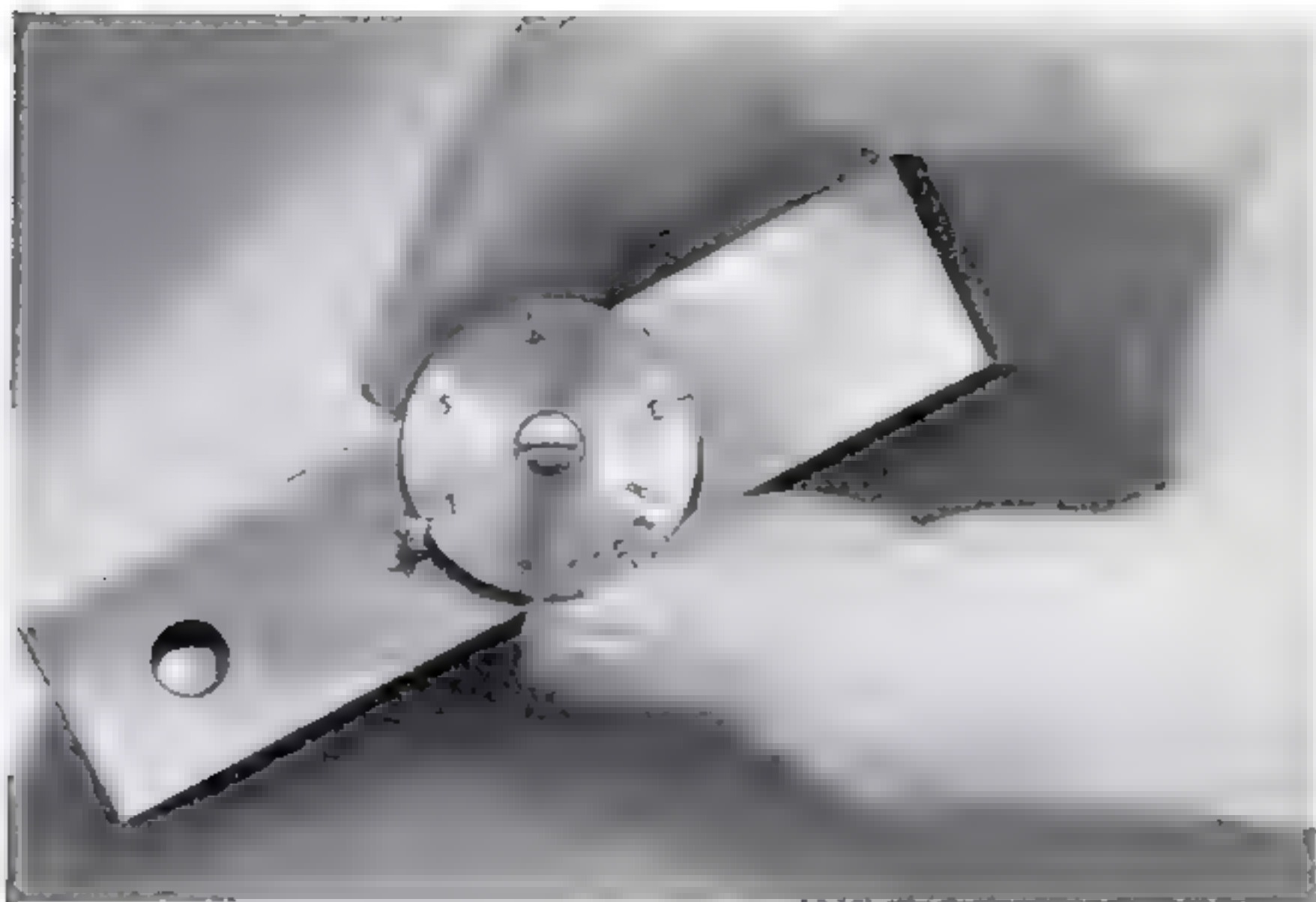
The two mirrors are cut  $\frac{5}{8}$ " by  $\frac{3}{4}$ ". With a large needle or other sharp point, scratch a center line on the back of one mirror running the long way of the mirror. Shave off the silver on one side of this line with a razor blade, being careful to keep the line straight.



The full-size range finder drawn as if one side of the housing had been cut away to show the mechanism. Above, photo of parts before being assembled

The mounting for this stationary mirror is made of thin brass and is soldered to one of the end plates by means of a small bracket as shown at A in the drawing. It may also be seen in the photograph above. The ends of the mounting strip are crimped over the edge of the mirror, and a drop of cellulose cement is run in between mirror and mount. The mirror must be placed at an angle of 45 deg., with its center between the two opposite or direct-view holes. The angle may be checked by holding the mirror in place and looking through the eyehole. If the angle is correct, the mirror will show a view straight out through the other end of the tube. Any necessary adjustment may be





The instrument is adjusted until the split images coincide; then the etched scale on the dial shows the distance in feet

made by slightly bending the mirror mount.

The movable mirror mount, which is built up of sheet brass and a small hinge, is soldered to the remaining end plate as shown at B. A small compression spring is fitted behind the mirror to keep the lever tight against the adjustment screw.

The adjustment assembly is shown at C. A  $3/16$ " hole is drilled  $1\frac{3}{8}$ " from the end of the tube to admit the adjustment screw, and over this hole is soldered a nut to fit the screw. A  $1/8$ " roundhead machine screw  $1/2$ " long with twenty-four threads to the inch is used as this size thread allows one turn of the screw to cover all distances up to 100 feet. The dial disk of heavy brass, 1" in diameter, is soldered to the screw head. A

small brass pointer is soldered in position so it will hook over the edge of the dial, thus preventing the dial from being screwed out. A short spring is placed under the dial to prevent lost motion and act as a slight drag.

The mirrors are next fastened in place by soldering on the end plates. It is best to put in the stationary mirror first, making sure that the silvered part will cut off just half the view through the eye-hole. The movable mirror is then held lightly in place with a C-clamp. Now, by using the adjustment screw and slightly turning the end plate, the images may be properly lined up. Some distant vertical line such as a tall post or the corner of a house should be

sighted for this adjustment. The end plate may then be soldered on. Use a hot iron and let the job cool after soldering each edge, or you may melt loose the mirror mounts and spoil your work.

Now get out your tape measure and prepare to mark your dial at 4, 5, 7, 10, 12, 15, 20, 25, 35, 50, 75, and 100 feet. Adjust the finder and make a small scratch on the dial for each distance. Dilute nitric acid is used to etch the dial after it has been dipped in melted paraffin and the lines and figures cut through the wax with a sharp point. A ring may be soldered on one end of the instrument so that it can be carried on a cord, although that arrangement is not shown in the photographs.

## BACK LIGHTING

## [PHOTOGRAPHY]



Back lighting is obtained when the lens faces the light source. The effect is possible with any camera.

1. Exposure. For the regular back-lighting effect, give sufficient exposure so that the shadow side of the subject will register detail on the negative. For a semi-silhouette effect, expose for the scene in general.

2. Protecting the lens. Rays direct from the light source (such as sunlight) must not be allowed to enter the lens. Use a lens hood or cast a shadow on the lens with the hand or any opaque object.

3. Development should be on the soft side to avoid blocking the somewhat overexposed high lights.

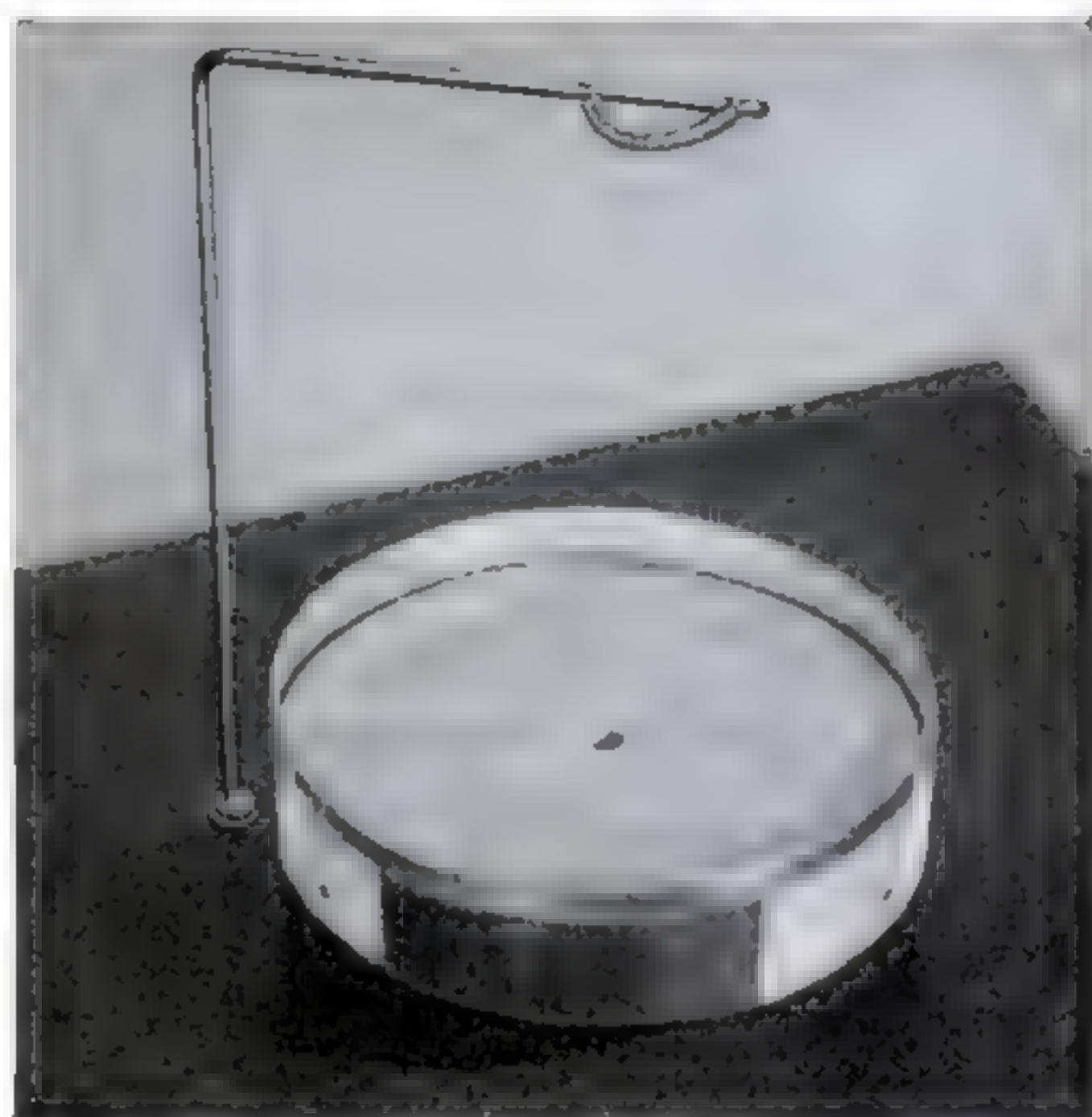
POPULAR SCIENCE MONTHLY SHOP DATA FILE





# JUNKED Phonograph Motor AGITATES Film Tank

While the tank spins on the turntable, the rod holds the reel stationary



**T**HE value of keeping films in constant agitation during development has long been recognized, but how many have the patience to sit and twirl the film-tank agitator knob. However, an efficient agitator can be made from an old phonograph motor, which can be obtained at most junk dealers for less than a dollar. These motors run about fifteen minutes on a winding. All that is necessary is to build a wooden turntable, the same diameter as the film tank, nail a tin wall around its rim, and substitute it for the regular turntable.

Alongside the turntable, attach a brass rod that extends upward to a height slightly

over the film tank, then, bends in at a right angle over the tank, reaching past the agitator knob. A small coil spring looped around the knob and attached at both ends to the brass rod, will hug the knob and hold the reel stationary while the tank spins on the turntable.

For tanks without an agitator knob, the motor can be placed at an angle of 10 deg., and the turntable, which will also be at that angle, can be mounted slightly off center. This will keep the fluid in constant motion.

With a little ingenuity, this same motor can be adapted to almost any type of film tank or developing drum.—LOUIS HOCHMAN.

## Paper Disks Mark Kind of Film in Holder

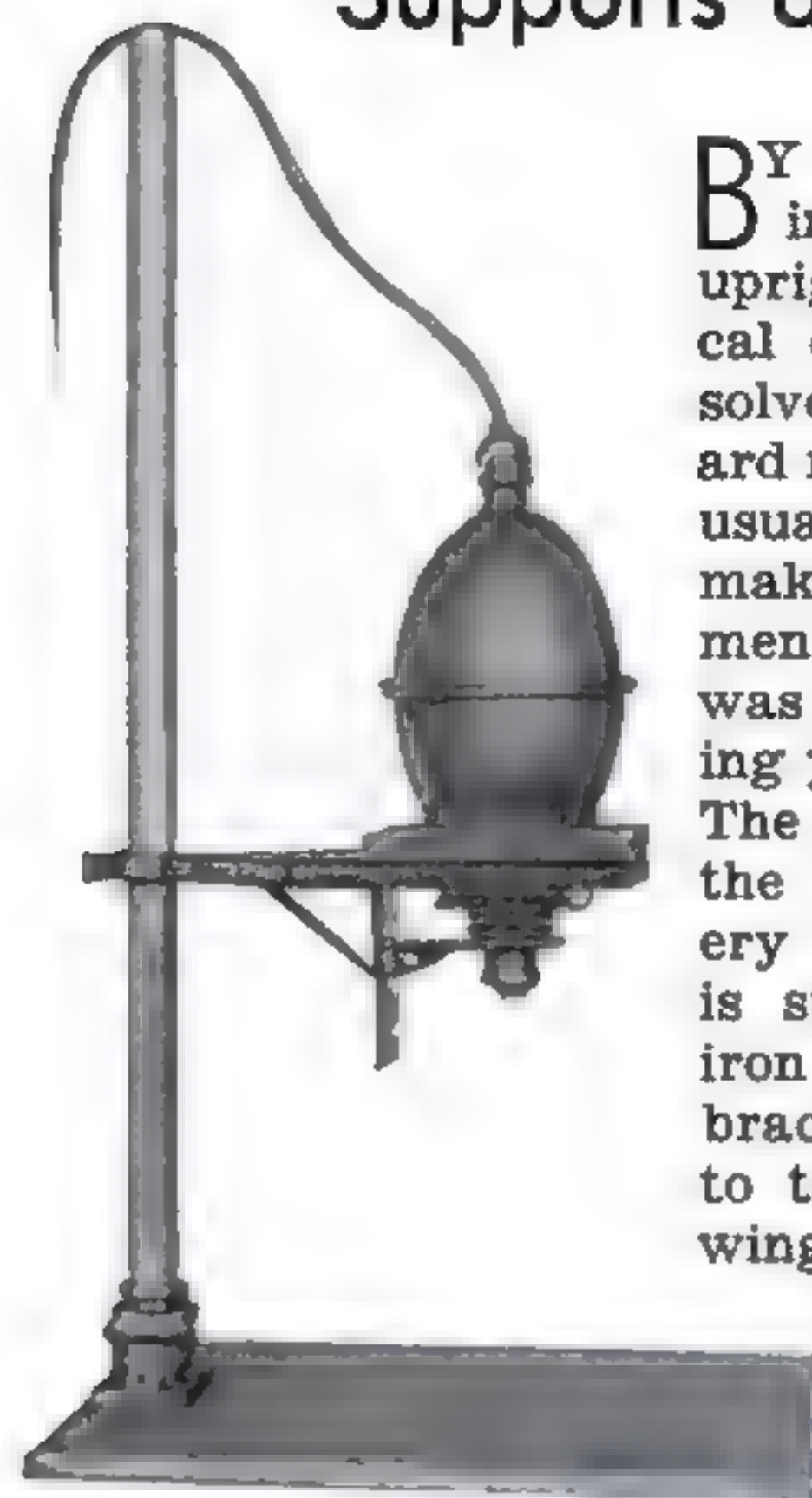
Now that amateur photographers are so conscious of the various types of photographic films available and like to have a choice of them to suit all conditions, it is necessary to mark each film holder in some way to show at a glance what particular kind of film has been loaded into it. An easy way to do this is to use disks of gummed paper cut out with a paper punch. For example, use red for panchromatic, yellow for orthochromatic, and white for fine-grain film.



The type of film in the holder is identified with a disk of gummed paper cut out with a paper punch



## Auto Steering-Column Housing Supports an Enlarger



The column should have a bracket and base of the type shown at the right

BY USING an old auto steering-column housing as the upright for a homemade vertical enlarger, it is possible to solve the problem of the standard much more neatly than the usual pipe and pipe fittings or makeshift wooden arrangement. This particular housing was purchased from a wrecking yard for less than a dollar. The paint was scraped off and the column polished with emery cloth. The enlarging head is supported by short angle-iron extensions bolted to the bracket. The bracket is clamped to the upright by a bolt and wing nut.—ALVIN C. PORTER.



The original supporting bracket is used as the adjustable support for the enlarging camera and lamp house. A bolt and wing nut hold it

## Miniature Films Developed in an Ordinary Tank



Two ordinary No. 4 developing hangers are spaced 3" apart as shown at the right so the miniature film can be wound on them for development in a regular cut-film tank

IN THE absence of regular miniature film equipment, an occasional roll of 35-mm. film may be developed in an ordinary cut-film tank. Two No. 4 developing hangers are held apart by means of 8-32 screws passing through the hooks in the ends of the handles and screwed into the ends of a pair of  $\frac{3}{8}$ " by 3" round iron rods, which have previously been drilled and tapped for the screws.

At one corner of the frame thus constructed is fastened a battery clip. At the opposite corner another clip is attached by means of a heavy rubber band. The film is then wound on as shown. Spacers made of loops of iron wire may be soldered to the lower edge of the frame as a guide in

winding on the film, but are not absolutely essential.

If the film is wound emulsion side out and handled with reasonable care, no scratches will result. Afterwards the film hangers can be dismantled and restored to their original use in a few moments.—W. O. W.

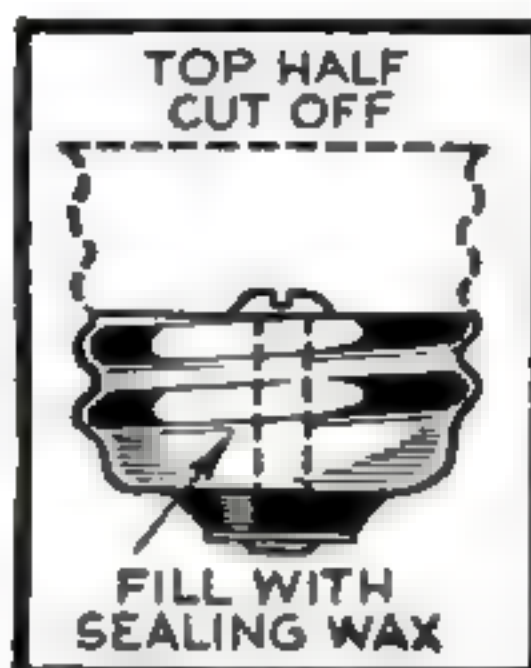




## Flash Bulbs Changed Quickly by Altering the Socket

IN TAKING action pictures with photoflash bulbs, success often depends upon the speed with which a used bulb can be removed and a new one inserted in the holder. The standard socket with which most amateur flash lamps are equipped has so many threads that time is lost, and there is also always some danger of burning one's fingers while unscrewing the used bulbs. This can be prevented by making a filler as shown to take up some of the socket space.

Cut or grind the brass base of an old bulb to half its original height, drill and tap a hole in the center for a 6-32 roundhead machine screw, insert the screw, and fill the base with sealing wax or melted sulphur. When this insert is in place, a flash bulb can be screwed tightly into the socket with a couple of turns.—W.C.W.



## Holder with Exposed Film Marked by Rubber Band

UNLESS a photographer follows a set routine and is very systematic in every move he makes, he is likely to find himself occasionally in doubt as to whether or not the film in a certain cut-film holder has been exposed. A simple way to avoid this and prevent double exposures is to slip a rubber band over each holder as soon as the slide has been replaced after an exposure has been made.—G.S.G.

### PRINT DEFECTS

[PHOTOGRAPHY]

**Spots.** Black spots may be due to undissolved particles of chemicals, such as metol, in the developer or to iron (rust) in the wash water. Dark brown spots are often caused by air bells, which adhere to the prints in the hypo bath and prevent fixation, or to amidol, metol, and other chemicals in dust form on the paper before or even after development. White spots may be due to blemishes on the negatives, lint, dust, or air bells in development.

**Stains.** Yellow stains may be caused by prolonged print development or contaminated developer, that is, developer with a trace of hypo in it. Yellow and brown stains that are not apparent at first but appear later are due to imperfect fixing or insufficient washing after fixing. Dark stains may also be the result of unclean dishes or hands.

**Blisters.** These are caused by too great a difference in temperature between solutions and wash water; developer containing too much alkali; too strong a fixing solution; rough handling of the print; too strong a solution of sulphide when toning, or too high a temperature of gold-toning solution.

POPULAR SCIENCE MONTHLY SHOP DATA FILE



## Wooden Sack Holder Saves Time in Bagging Root Crops

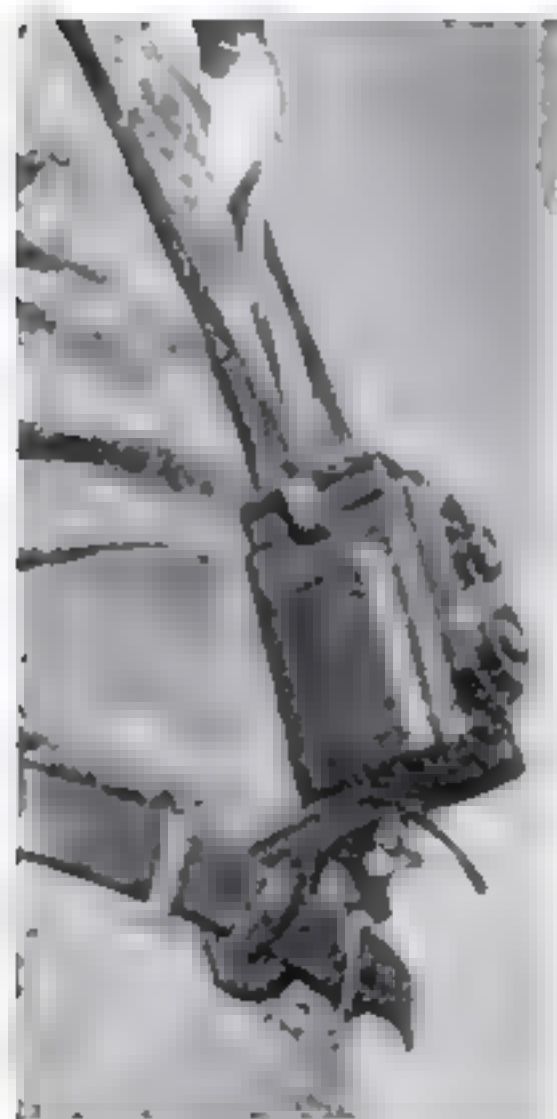
WITH a substantial wooden sack holder of the kind illustrated at the right, a potato crop or other root crop may be bagged by one person working alone without the annoyance of a single spill. Scrap lumber can be used to make the platform, upright, crossbar, and arms. One of the arms is solid. The other is hinged to the crossbar so that it can swing inward, but it is normally held outward by a spring or a heavy rubber band cut from an old inner tube. Hooks driven into the arms engage the top of the sack. The upright should not be long enough to raise the bottom of the sack off the platform.—N. W.



## Handling Porch-Awning Lines

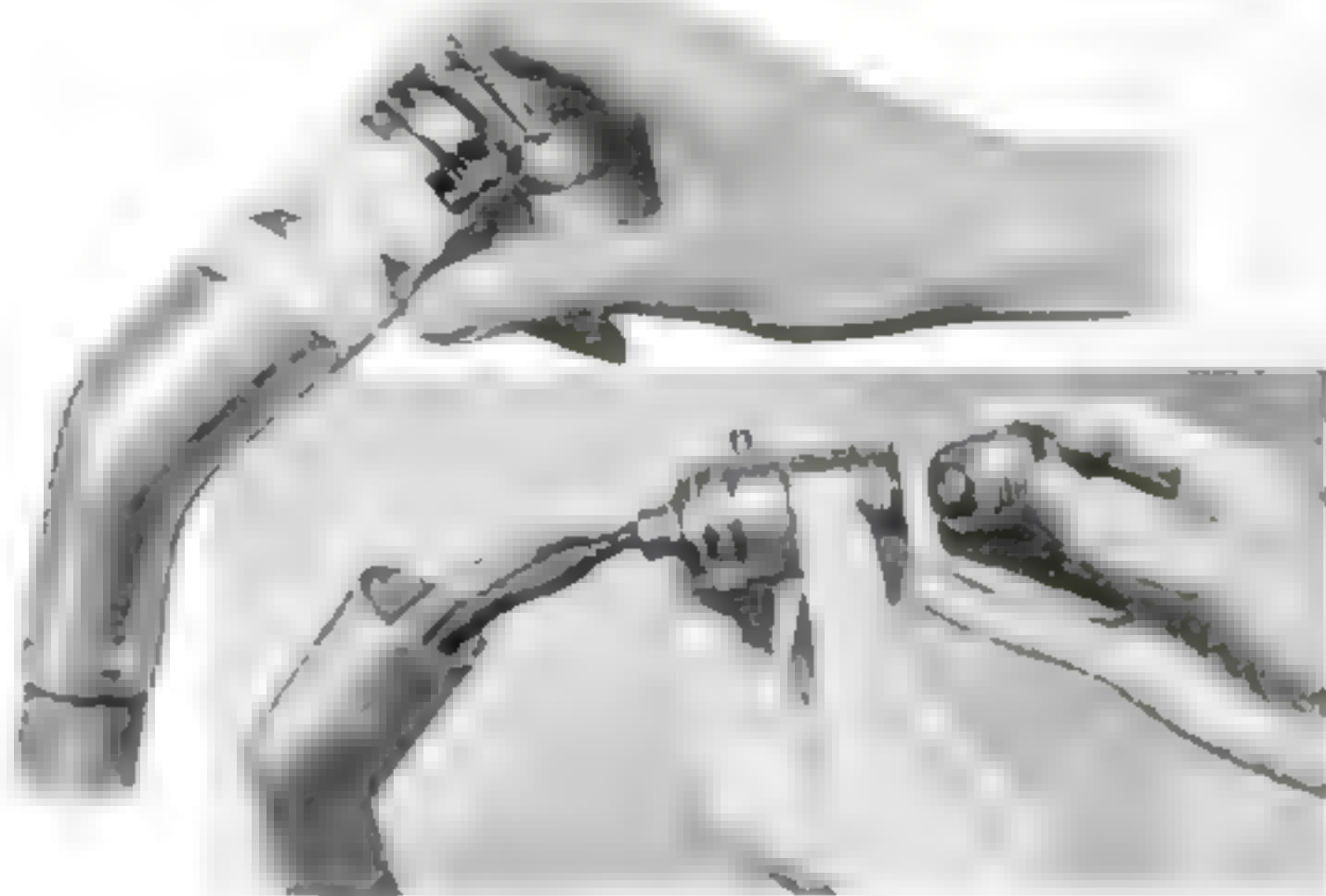
WHEN awnings are hung outside of screened porches, the operation of the lines often becomes quite a problem. Going outside to raise or lower the awnings can be avoided if plain brass grommets are put in the screens to admit the awning lines. There should be one grommet for each line, and the grommets should be so placed as to allow the lines to pull straight from the blocks to the cleats, or nearly so. The No. 0 size grommets are large enough in the majority of cases.

## Camera Fastened to Belt



A SMALL camera carried by a neck strap will bounce and swing as you walk. To prevent this, anchor it to your belt as shown by using a piece of heavy leather and an extra tripod screw. Cut two parallel slits in one end of the leather so your belt will slip through it. In the other end, make a hole through which the tripod screw can be inserted and screwed into the bottom of the camera. Extra steadiness for

hand exposures will be gained if the camera is pushed forward until both neck strap and belt anchor are taut.—ERNEST ROBSON.



## New Vacuum-Cleaner Switch

TO REPLACE a worn-out switch on our vacuum cleaner, I used an ordinary lamp socket equipped with a push-button switch. After connecting it, I pushed it into the handle and taped it securely. A glass household fuse was then screwed into the socket.—B. N.

## Tape Marks Miniature Films

IN THE process of examining a strip of miniature film to pick out certain negatives for enlarging, you can save time and find the desired negatives more quickly later on if you attach a small piece of adhesive tape along the edge of the film opposite each one selected. The tape is easily seen or felt in the darkroom.—RAY KERSHNER.





# IMPROVED Hollow Surfboard

## FOR ALL-AROUND SPORT



**D**ESIGNED for all-around use, this streamline hollow surfboard is of the latest life-guard type. It carries two persons easily.

Use white cedar, mahogany, spruce, redwood, or white pine as follows: 2 pc.  $\frac{3}{4}$ " by  $3\frac{3}{4}$ " by 14' for rails; 2 pc.  $\frac{3}{4}$ " by  $1\frac{5}{8}$ " by 14' for battens; 2 pc.  $\frac{3}{4}$ " by 5" by 8' for ribs; 1 pc.  $1\frac{3}{4}$ " by  $16\frac{1}{8}$ " by 17" for bow block; 1 pc.  $2\frac{5}{16}$ " by  $2\frac{7}{8}$ " by 8" for stern block; 4 pc.  $\frac{1}{4}$ " or  $\frac{3}{8}$ " by 12" by 13' 9" for planking, or if wood a full 12" wide is not available,  $\frac{1}{4}$ " or  $\frac{3}{8}$ " waterproof plywood or  $\frac{1}{8}$ " pressed com-

By  
**TOM BLAKE**

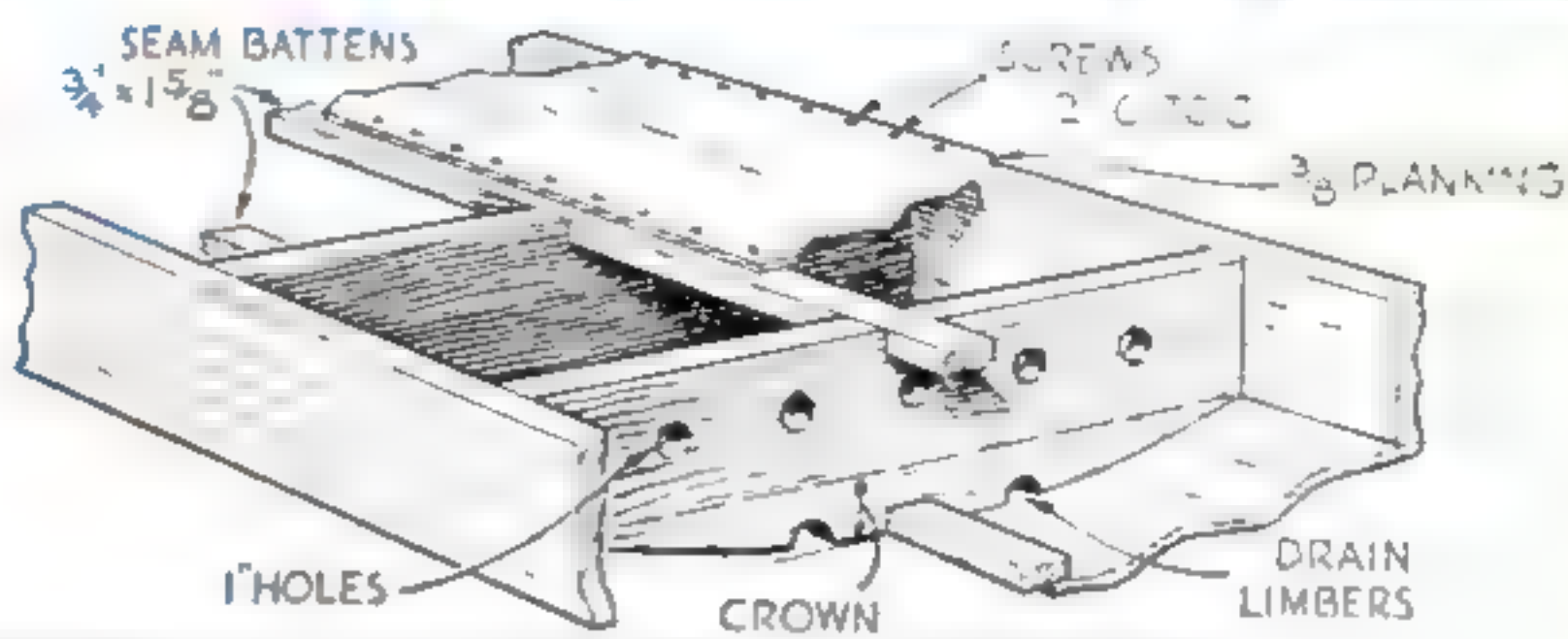
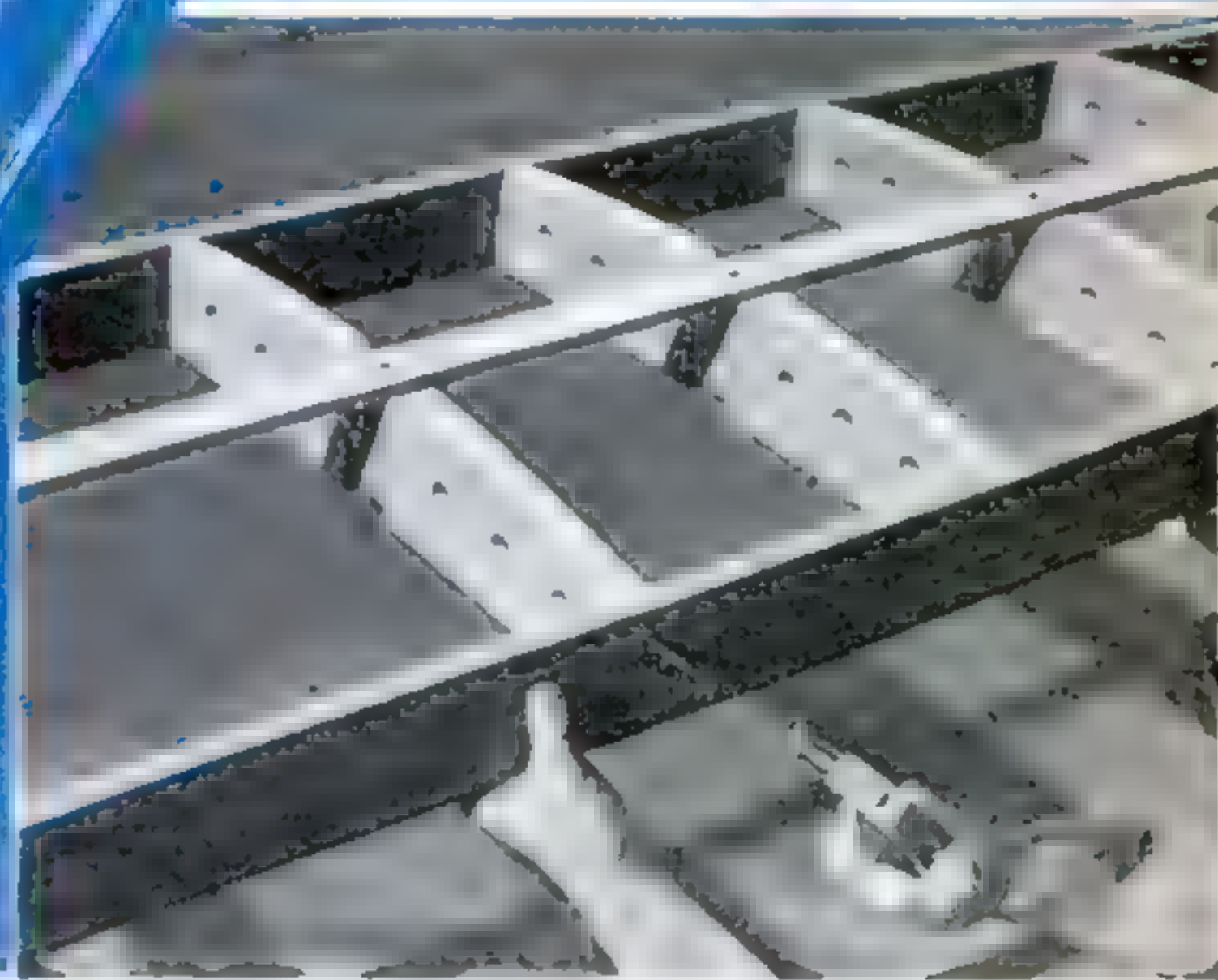
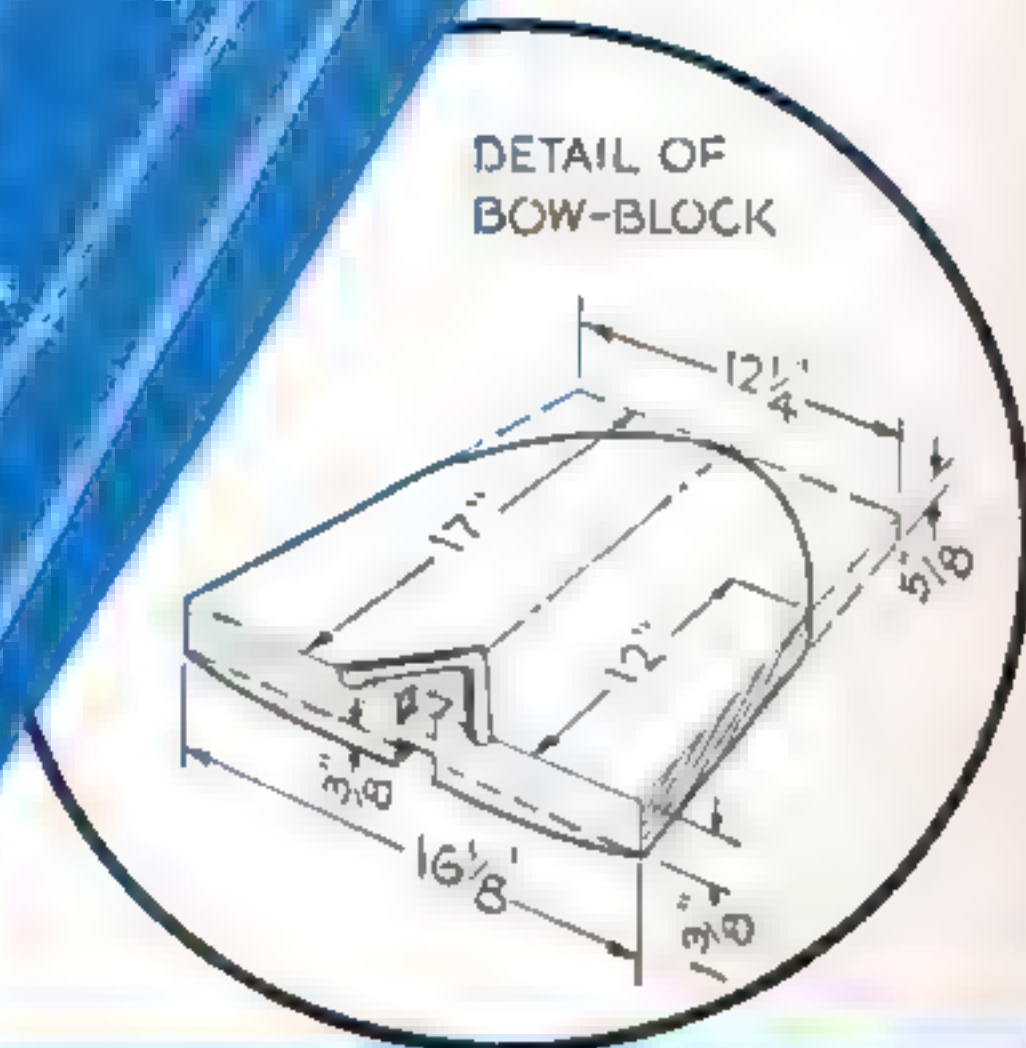
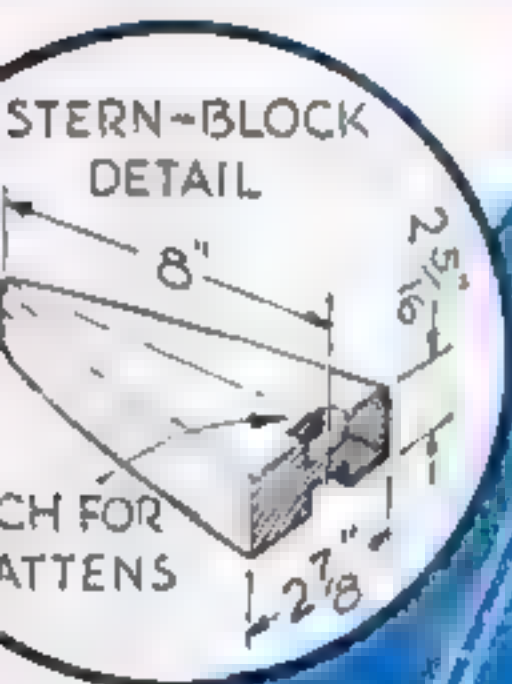
position wood of tempered quality may be used instead. Miscellaneous: 18 No. 12 flathead brass screws 2" long and  $4\frac{1}{2}$  gross  $\frac{3}{4}$ " No. 6; 1 pt. marine glue; 90'

thin cloth tape; brass yacht deck plug; spar varnish.

Cut and shape the stern and bow blocks. Make notches as indicated for the top and bottom battens. Prepare the ribs, following the table for dimensions. The bottom of the ribs is the smooth arc of a circle. Cut notches for battens and limber holes; drill 1" holes at intervals across width. Fasten batten to

Native Hawaiians taught Tom Blake to ride the waves, but he wasn't satisfied with their crude boards. After years of experimenting, he developed the modern hollow surfboard, now used not only by the beach boys of Waikiki, but by swimmers throughout the world. Here he tells how to make his latest model, for paddling, aquaplaning, sailing, or rescue work.





| TABLE OF DIMENSIONS |        |        |        |        |        |        |        |       |        |        |        |       |
|---------------------|--------|--------|--------|--------|--------|--------|--------|-------|--------|--------|--------|-------|
| STATION             | 0      | 1      | 2      | 3      | 4      | 5      | 6      | 7     | 8      | 9      | 10     | 11    |
| WIDTHS              | 12 1/4 | 16 1/8 | 19 1/8 | 20 7/8 | 21 5/8 | 21 3/4 | 21 1/8 | 20    | 18 1/8 | 15 3/4 | 12 3/4 | 0     |
| HEIGHTS             | 5/8    | 1 3/8  | 2      | 2 1/2  | 3      | 3 1/4  | 3 1/2  | 3 3/4 | 3 3/4  | 3 5/8  | 3 3/8  | 2 1/4 |
| CROWN               | 0      | 3/8    | 1/2    | 3/4    | 1      | 1 1/4  | 1 1/2  | 1 1/4 | 3/8    | 1/2    | 1/4    | 0     |

NOTE: "WIDTHS" ARE TO INSIDE OF SIDE PIECES. "HEIGHTS" ARE AT SIDES OF FRAME. "CROWN" IS DEPTH OF CURVE AT BOTTOM.



floor or bench with several small nails. Arrange the ribs, flat sides down, starting with No. 10 at the stern. Place side rails with the top or straight sides down. Apply glue to stern block, bring stern ends of rails together, and clamp; then screw rails to stern block. Do the same at the bow. Place the other center batten in position and screw to stern block, ribs, and bow block.

Cut and fit bottom planking. Slightly underbevel the edges of the rails to insure a closed seam along bottom edge of boards. Apply marine glue, place thin cloth tape on all glued surfaces, add another coat of glue, and clamp the bottom planks in place. Screw them down tight. Remove surplus glue with gasoline and fill any cracks with seam putty.

Turn the hull over and coat the inside with paint, varnish, tar, or oil. Fasten the top center batten in place, apply glue and tape as on bottom, and screw down decks after marking position of the water drain.

Round all edges as much as the material will allow. If the deck screws are countersunk, fill the holes with a compound that will set hard. Bore the drain hole, and use either a brass yacht deck plug or an ordinary cork to close the drain. Sandpaper the entire board thoroughly and apply several coats of spar varnish, sanding lightly between coats. The board may be finished in colors, if desired.

If the board is for wave riding, the decks may be of  $\frac{1}{2}$ " stock, making the total weight about 90 lb. The weight of the board as shown is about 70 lb.



Posed on the sand for clearness, this view shows how a mast support may be lashed on. Steering is done with feet



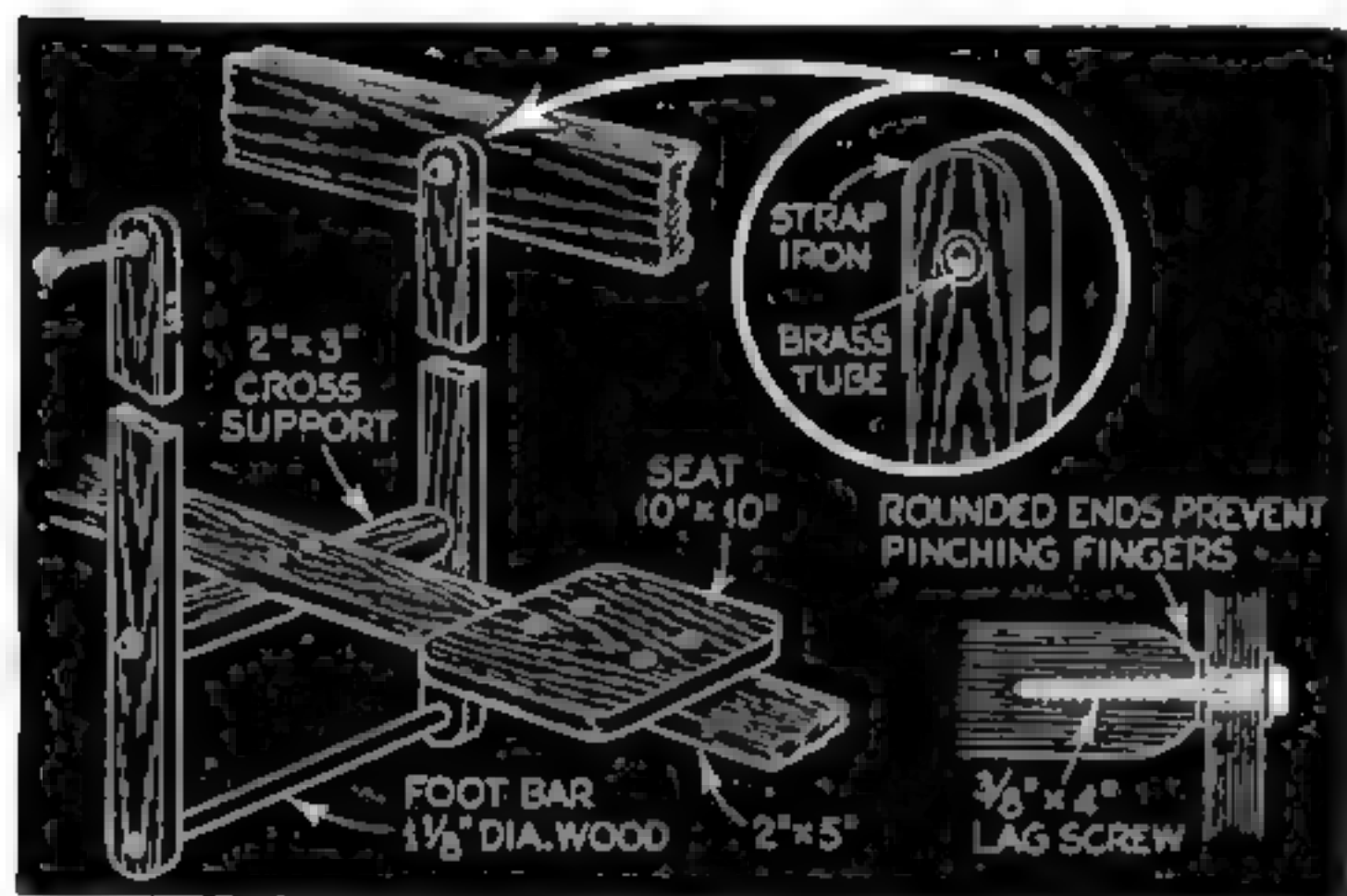
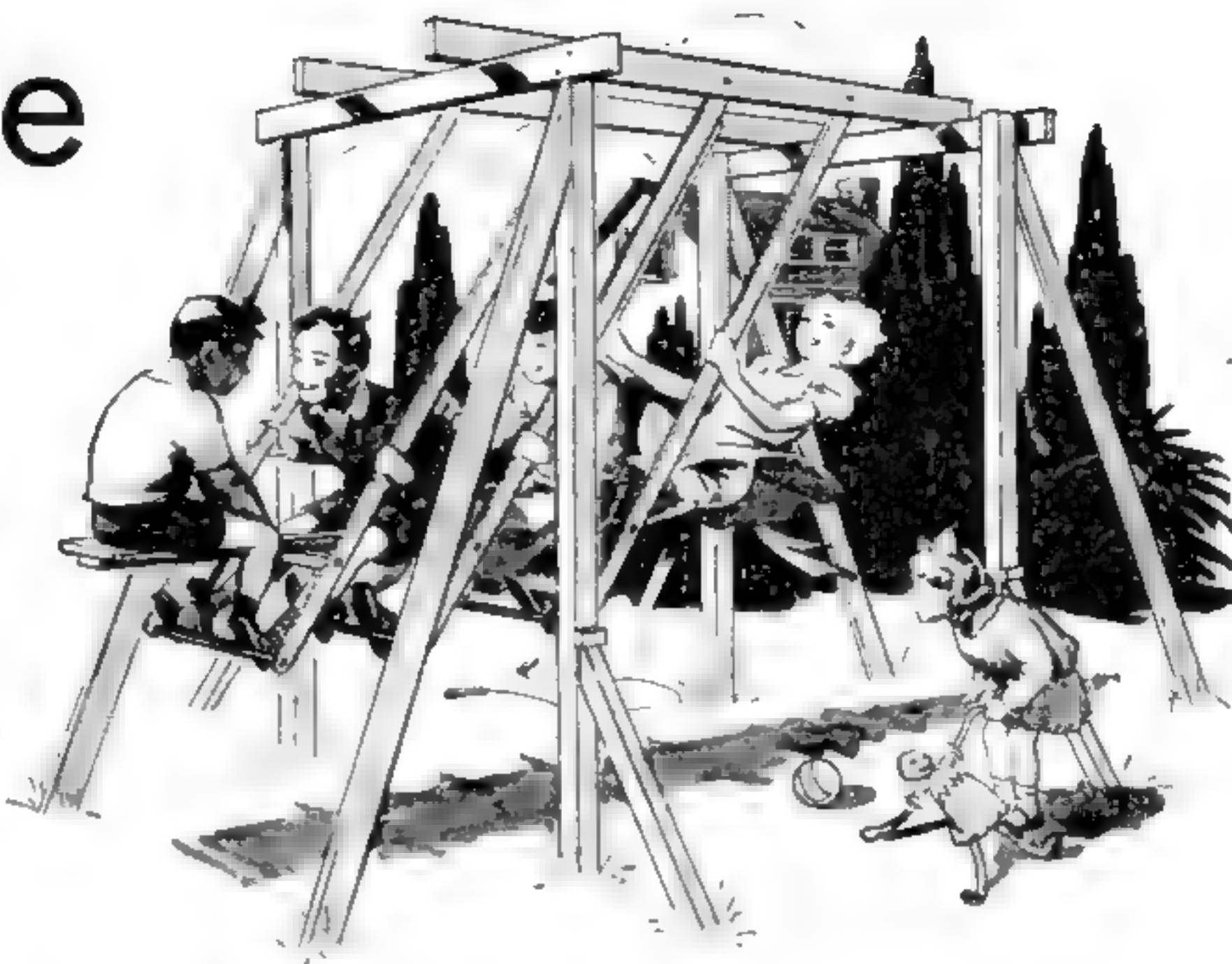
Hollow surfboards are used extensively for life-saving. They can be paddled with the arms about seven miles an hour



# Four-Place Swing

## DESIGNED FOR SAFETY

**A**LTHOUGH the unique swing shown in the accompanying illustrations can accommodate four children as passengers, one child can swing it alone without undue effort. It is so designed that side sway is eliminated, and there is no place where wandering fingers are likely to be pinched—always an important consideration where children are concerned. Passen-

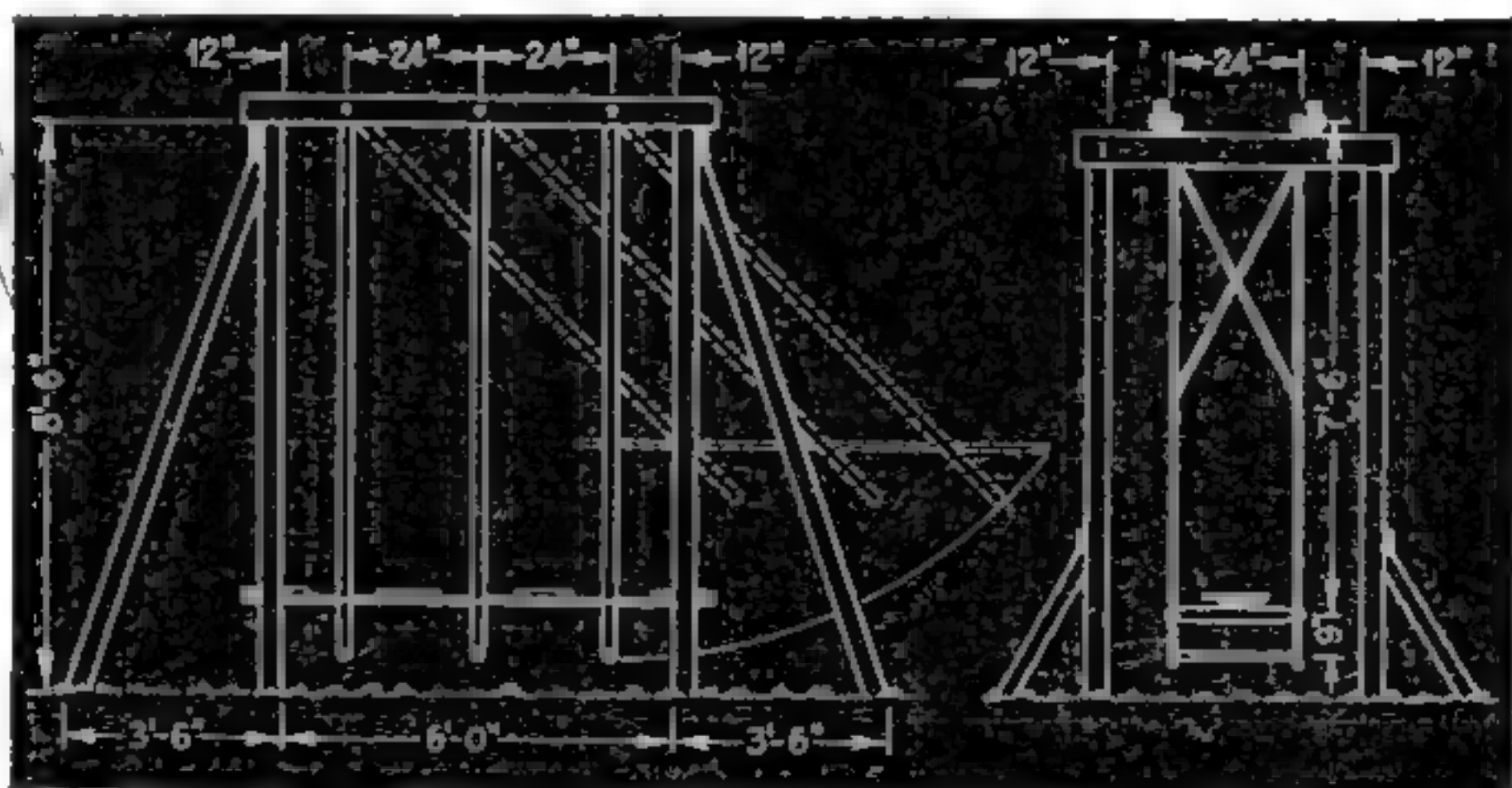
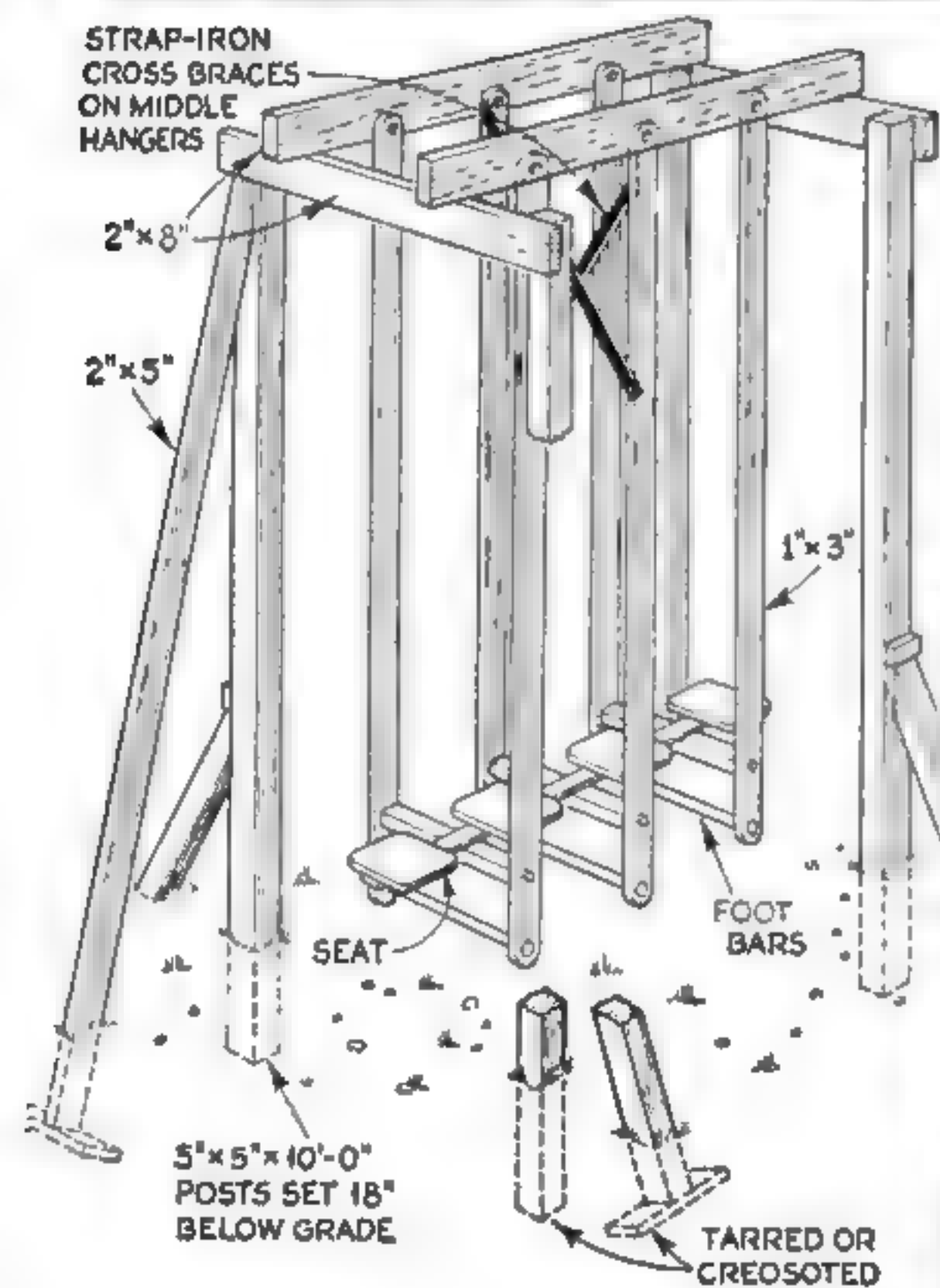


gers in the swing may sit facing either way.

Make the framework of sound material approximately the sizes specified. The bottoms of the posts which go into the ground should be treated with asphaltum paint or creosote to forestall decay. For the hangers that support the swing, select vertical grain pine or other strong, straight-grained, knot-free material. The ends are reinforced with strap iron to prevent splitting, and short sections of brass tube are set in the bolt holes to provide durable and noiseless bearings. One of the reasons most outdoor equipment loses its popularity is, indeed, the noise and looseness of neglected bearings. However, even if oiling is neglected, the brass bearings of this swing will give little annoyance.

The cross members supporting the seat plank are rounded at the ends so that there will be no crevices to catch clothes or pinch fingers. Another advantage of the design is that it provides ample leg room. Strap-iron cross braces are fastened on the middle hangers as shown in the end view below to prevent side sway.—HI SIBLEY.

The general method of assembly appears in the small side and end views below. The broken-away perspective view at the left and the larger sketches above show the actual details





# BOAT PAINTING

**W**HILE the general methods of painting small boats are the same for all classes, there are certain variations according to the type of boat. The following specifications are for new boats, but a study of them will also make it clear what is required for repainting from time to time.

*Lapstreak or clinker-built hulls.* 1. Sand

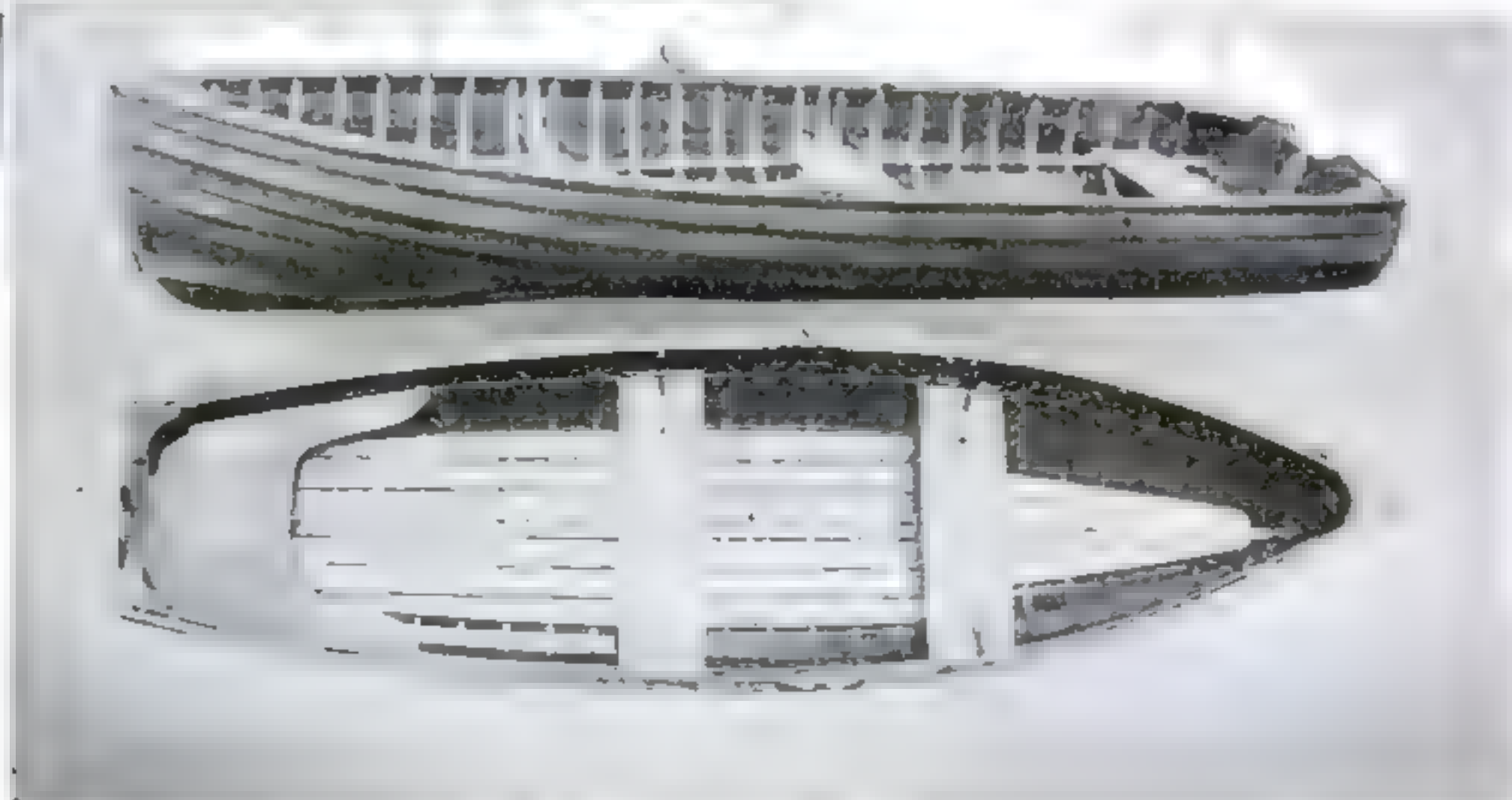
smooth with  $\frac{1}{2}$ , 00, and 4/0 open-faced garnet sandpapers and a heavy felt block. 2. Fill all exposed surfaces with hard-drying marine-type silex filler, well cleaned and dried forty-eight hours before coating. 3. Prime all inside and outside surfaces with one part quick-drying marine spar and one part pure turpentine by brush or spray. 4. Dry as long as practical, but not less than forty-eight hours with heat. Sand carefully with the worn 4/0 paper left after operation 1. 5. Putty-glaze with colored-to-match, hard-drying, lead-base putty as needed over brad holes, dents, or other imperfections. Dry forty-eight hours and sand. 6. Dust off, use a tack rag, and varnish full body. Dry hard. Sand with 6/0. 7. Revarnish to three or four full coats on new work, sanding between coats. Last coat to be left full gloss.

*Sailing dinghies, sloops, and cruisers.* If the hull is to be finished natural, proceed as for lapstreak hulls. If, however, the hull is to be enameled: 1. Prime with marine-type red-lead primer. Dry one week with heat if possible. Sand lightly with 4/0 open-faced garnet. 2. Glaze all seams with suitable marine-cement putty. Knife clean and level. 3. Cuff off lightly but smoothly with 4/0 garnet. 4. Brush on hard racing bottom enamel. (If, however, the hull is to be used in salt water, substitute antifouling bottom paint. This cannot be sanded because it is relative-



Hard racing bottom enamel is used for fresh-water sailboat hulls. Right, lapstreak boats finished in marine spar varnish

**PART TWO**  
**By**  
**RALPH G.**  
**WARING**





# As It Should Be Done



Speed boat with varnished mahogany topsides and deck. The bottom is hard racing enamel, and the boot-topping or stripe between it and the topsides varnish is white enamel. Black is often used instead

ly soft.) Dry hard, sand with 4/0 wet-or-dry paper, and recoat. 5. Repeat to four coats. Allow all possible time between coats and water-sand each. Leave last coat in full gloss. 6. Topside paint may be either black or white, but the white must be resistant to oil, grease, or sulphide water, and capable of weathering white. 7. Boot-topping should be hard drying to facilitate cleaning off growths that accumulate at the water line in fresh waters. Black is generally used, but occasionally white. Two coats should be applied. 8. Canvas decks, strips, or covers should be well filled, dried, sanded, and fin-

ished with from two to four coats of the proper color deck paint, well worked in, dried, and sanded between coats. Last coat to be left as brushed or sprayed. 9. All exposed mahogany, trim, spars, or other natural wood to be filled, primed, and finished in four coats of quick-drying marine-type spar varnish. Sand between coats; leave last coat in full gloss. Give all possible time between coats. 10. For cabin interiors, use eggshell-gloss marine enamels.

To insure clean dividing lines, you may find it advantageous to use regular painter's masking tape of the self-adhering type.

## SPREADING RATES FOR MARINE FINISHES

[PAINTING]

1. Paste filler, if 10 lb. of paste is used per gallon of thinner (1 part pure turpentine plus 2 parts gasoline) will cover 500 sq. ft. per gal.
2. Yacht gloss white, 700 sq. ft. per gal.
3. Yacht gloss black, 800 sq. ft. per gal.
4. Marine deck paint, 600 sq. ft. per gal.
5. Marine antifouling bottom paint, 500 sq. ft. per gal.
6. Marine hard racing bottom paint, 600 sq. ft. per gal.
7. Marine bottom, bronze, 600 sq. ft. per gal.

POPULAR SCIENCE MONTHLY SHOP DATA FILE





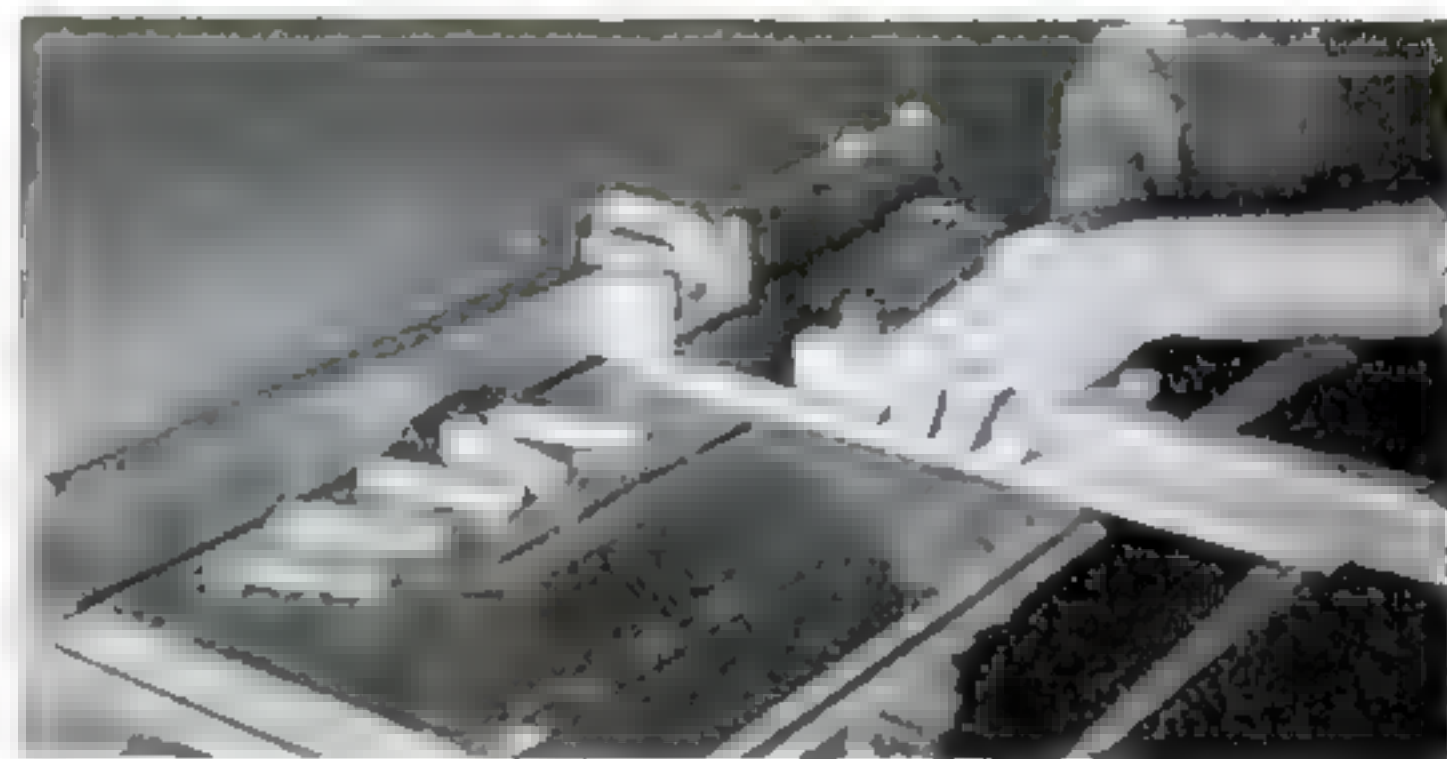
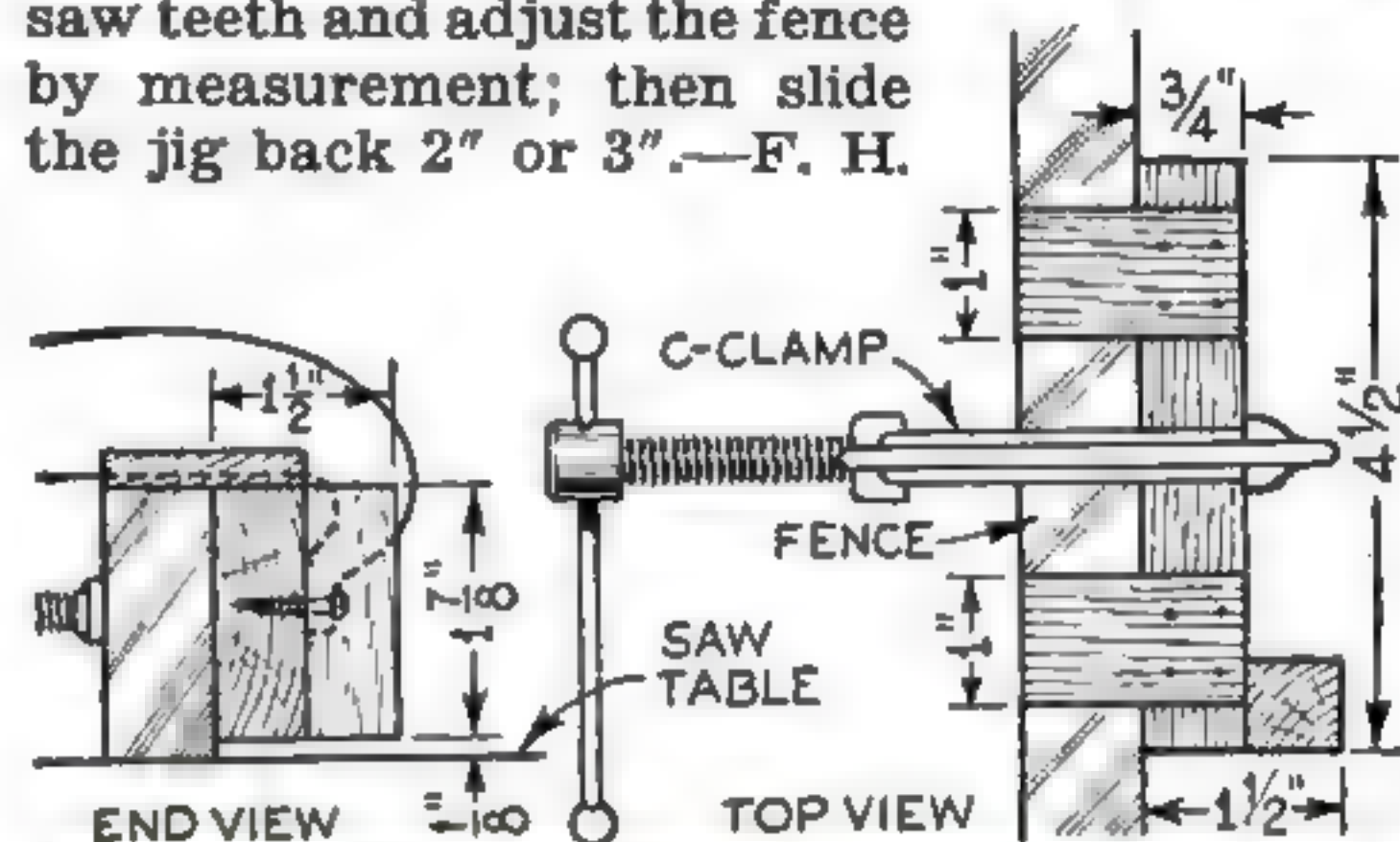
## Old Fence Posts Lifted with Lever and Chain

MANY devices are used for lifting fence posts, but for ordinary use the homemade one illustrated above will serve surprisingly well. Heavy, hard-to-pull posts can be raised with it. Obtain a stout piece of hardwood and a heavy iron bar. In one end of the block of wood cut a slot for the bar. Drill through both members for a heavy bolt and assemble as shown. Bolt a short piece of chain with a hook at one end to the short end of the lever. To operate, hook the chain around the post loosely and pry. As the post comes out, let the chain slacken and slide down the post. Then pry again.—NORVAL WRIGHT.

## Cutting Duplicate Pieces on a Circular Saw

FOR cutting duplicate pieces of wood to length on a circular saw without danger of a kick back, the jig below will be found convenient. The drawings are for a saw fence 1" thick and 2" high. Note that there is  $\frac{1}{8}$ " clearance between bottom of jig and saw table. The stationary jaw of a 2" clamp is cut so that it may be screwed to the jig.

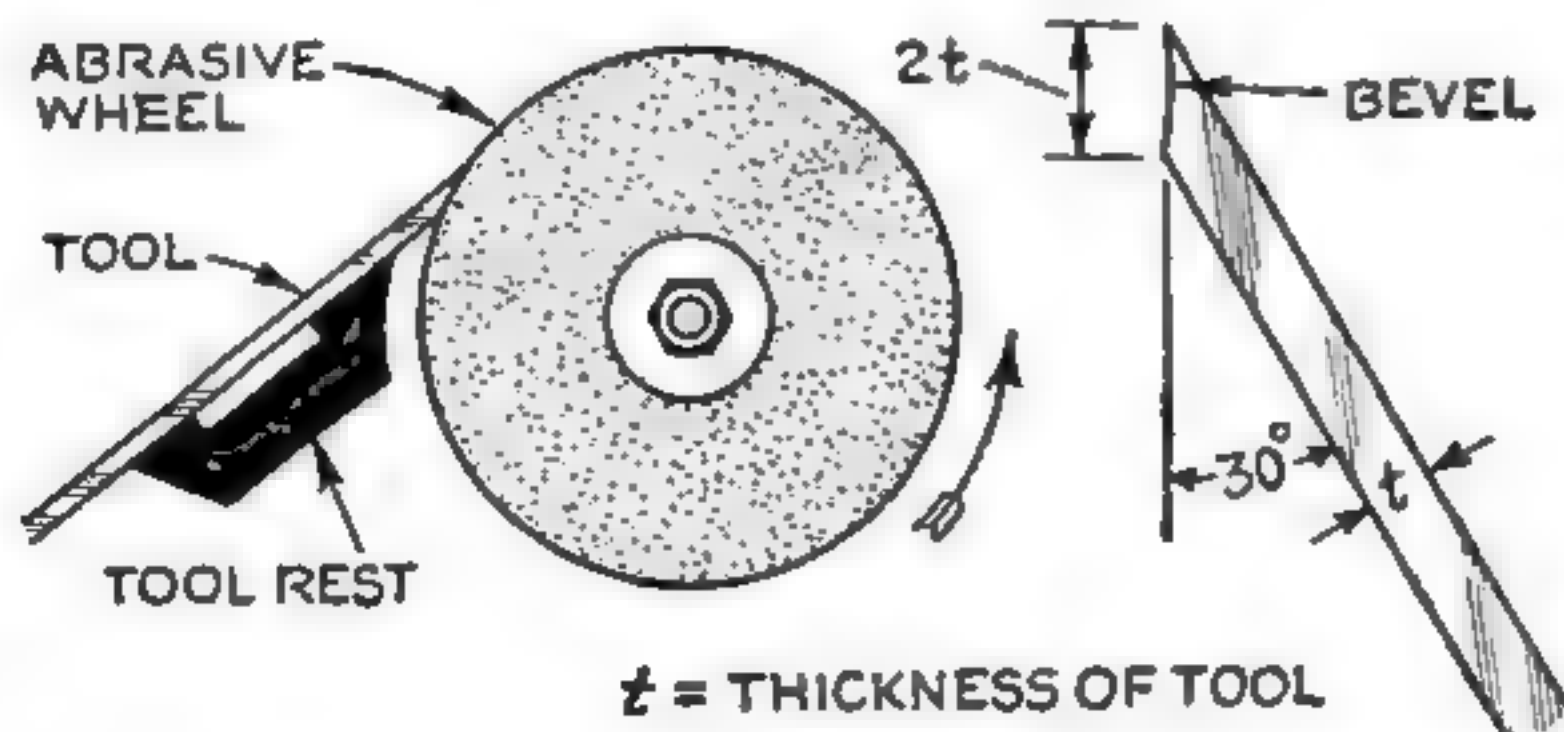
If your saw has a graduated scale, merely allow  $1\frac{1}{2}$ " extra in setting the pointer; otherwise slide the jig up parallel with the front saw teeth and adjust the fence by measurement; then slide the jig back 2" or 3".—F. H.



## PLANE IRONS AND CHISELS—GRINDING

[WOODWORKING]

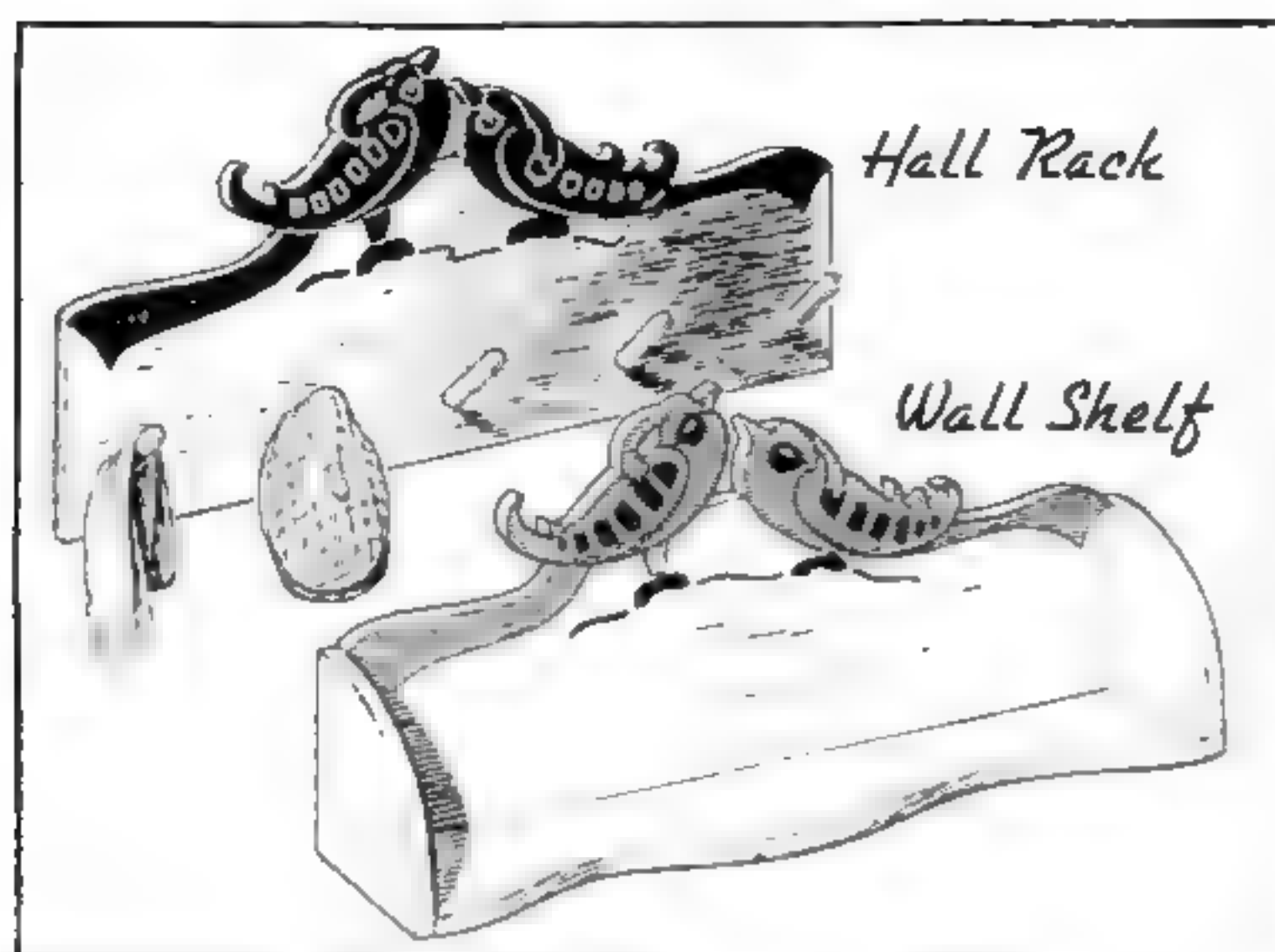
Plane irons and chisels are ground on the beveled side only. Either an ordinary tool grinder or a sandstone wheel may be used. The grinding wheel must revolve toward the tool, which should be held firmly and moved from side to side across the stone with moderate pressure. For average work the bevel should be twice as long as the thickness of the tool. The tool must be kept cool by frequent dipping in water when used



with a small grinder, or by letting water drop on the stone, if of the sandstone variety. Burning (indicated by a blue color) ruins the tool. After being ground, the tool should be free from nicks, slightly concave along the bevel but straight across, and having the edge square with the sides.

POPULAR SCIENCE MONTHLY SHOP DATA FILE



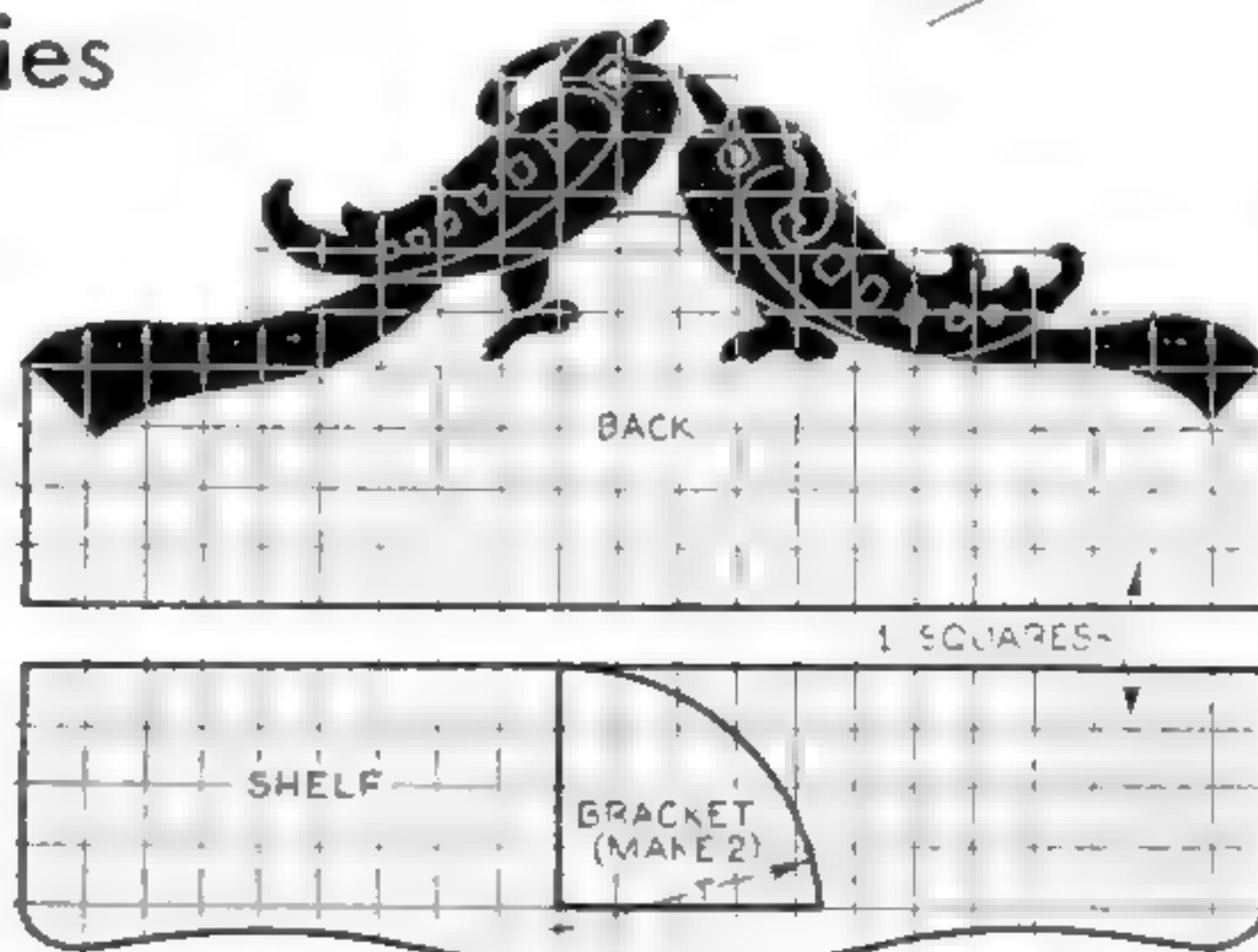


A small hall rack and a general utility shelf are shown above, and a colorfully enameled towel holder at right



## Graceful Bird Pattern Decorates Various Small Novelties

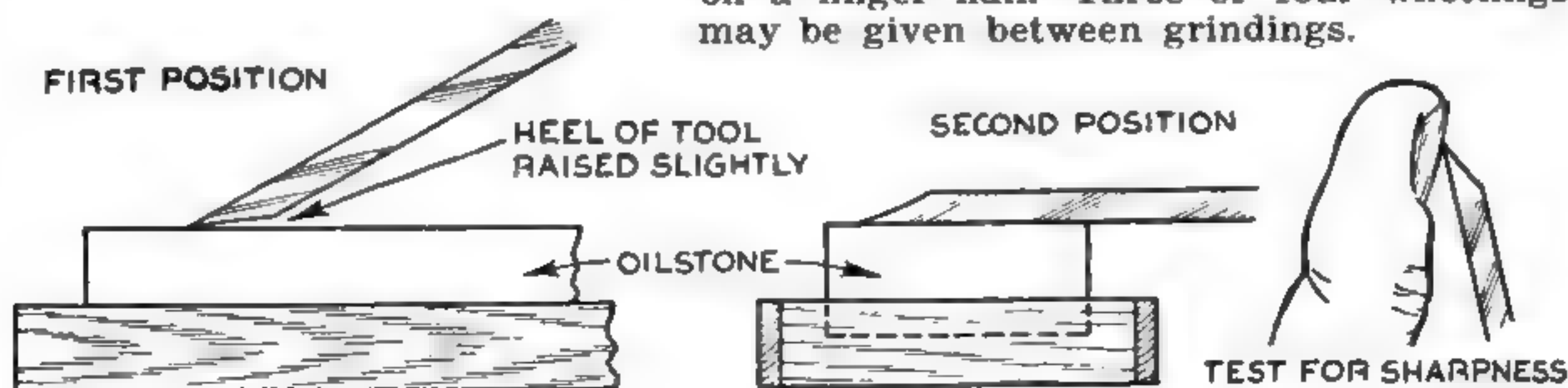
SEVERAL decorative wooden articles may be made from the bird pattern illustrated. If cut from  $\frac{1}{2}$ " wood and assembled with two end brackets and a shelf, it will serve as a useful wall shelf. The lines and spots on the birds might be carved out, if desired, and given a dark stain; then apply a medium-dark stain over the birds alone, and give one or two coats of clear varnish to the entire piece. A similar backpiece may be used with two small brackets and a broomstick rod to form an enameled towel rack. A hall rack may be made from 1" wood by setting in five wooden pegs at an angle.—H. F. S.



## PLANE IRONS AND CHISELS—WHETTING

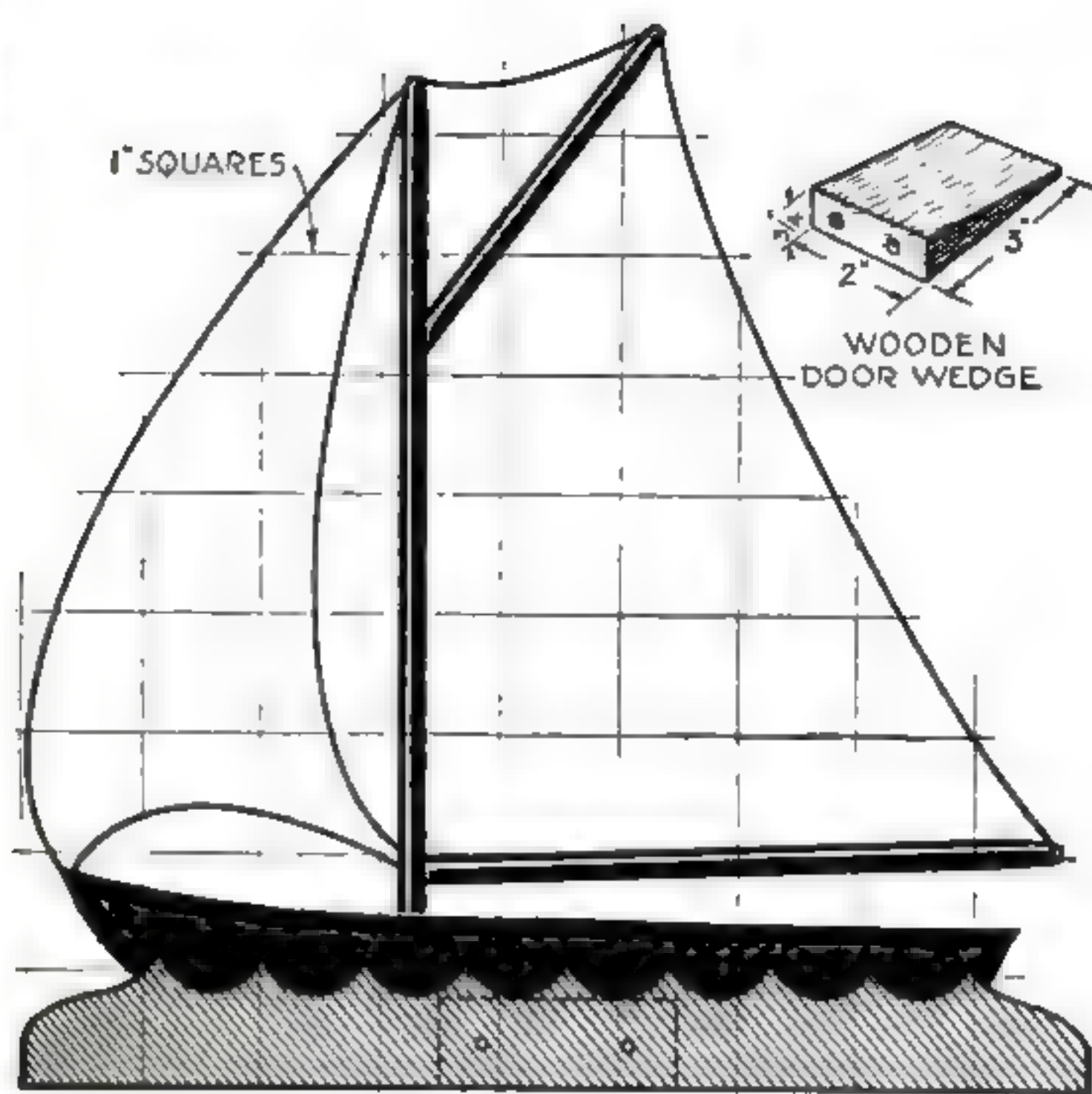
[WOODWORKING]

The wire edge formed by grinding is removed by rubbing the plane iron or chisel on an oilstone (whetting). A mixture of half kerosene and half machine oil may be used on the stone. Hold the plane iron or chisel firmly so that the heel of the bevel is raised slightly above the stone. Rub back and forth with moderate pressure. Reverse the iron or chisel and rub the back a few times, holding it *absolutely flat*. Continue in this way until the wire edge is removed and a keen edge is formed. Finish rubbing on a leather-covered block. Test for sharpness on a finger nail. Three or four whettings may be given between grindings.



POPULAR SCIENCE MONTHLY SHOP DATA FILE





## Door Stop Scroll-Sawed in Shape of Sailboat

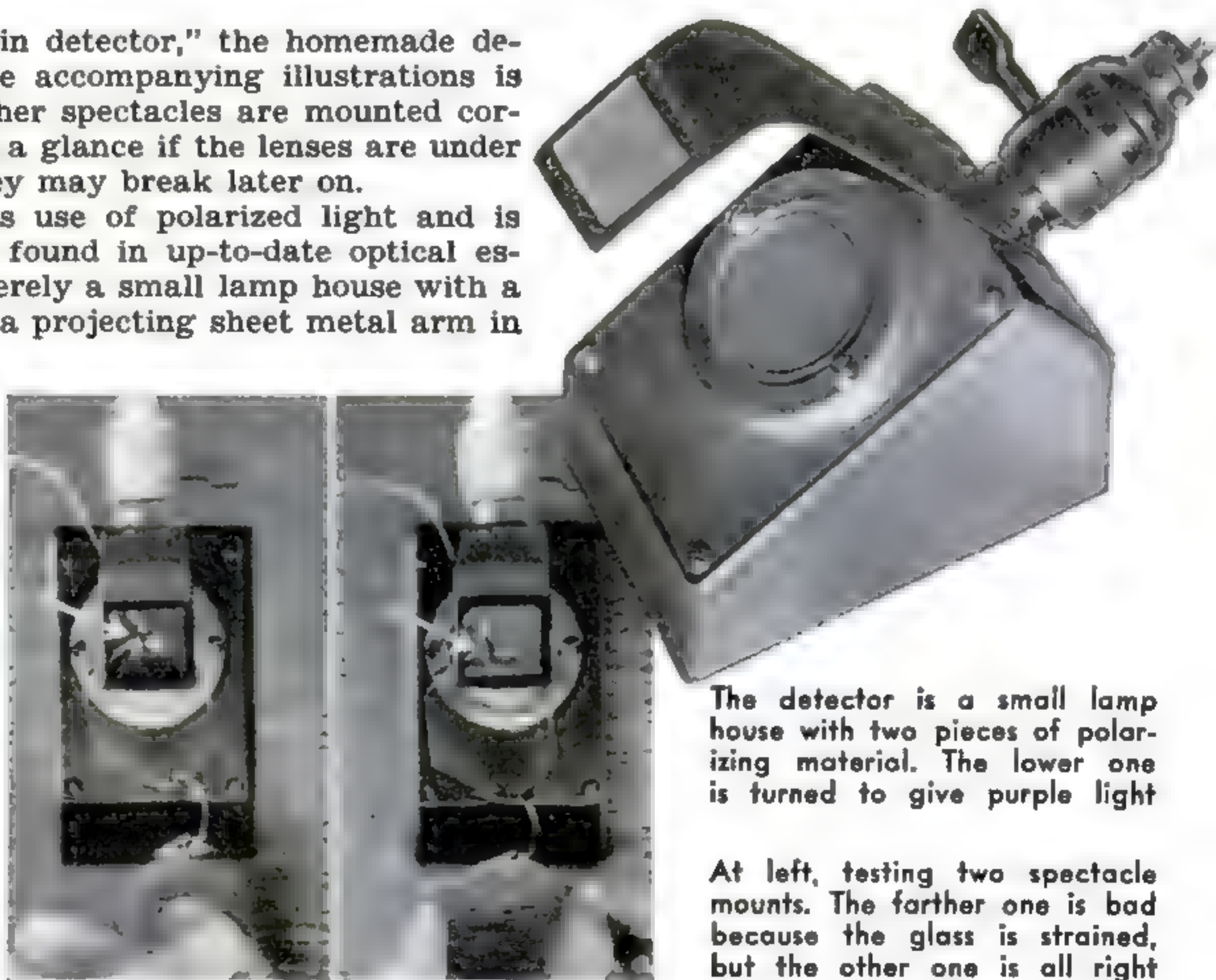
**T**HIS nautical door stop is scroll-sawed from  $\frac{3}{8}$ " plywood, and the mast, boom, and gaff are  $\frac{1}{4}$ " dowel rods, planed flat on one side and tapered toward the ends. Paint

the sails flat white, the hull bright red, and the water green. Leave the spars the natural wood color or varnish them. Fasten the sailboat to a wooden wedge.—FRANK MCCARTY.

## Strain Detector Shows Flaws in Spectacle Mountings

**K**NOwn as a "strain detector," the homemade device shown in the accompanying illustrations is for determining whether spectacles are mounted correctly. It indicates at a glance if the lenses are under such a strain that they may break later on.

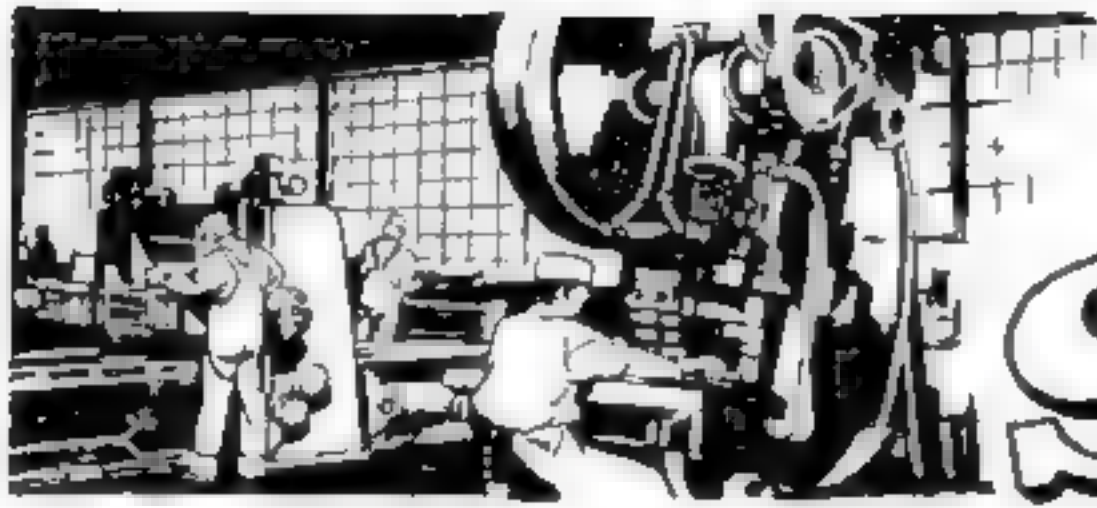
The machine makes use of polarized light and is similar to those now found in up-to-date optical establishments. It is merely a small lamp house with a circular window, and a projecting sheet metal arm in the end of which a rectangular opening is cut. Polaroid is mounted in both these windows and crossed in such a way as to give purple polarized light. When the spectacle mount is placed between the two windows, it can be seen at once whether the glass is being subjected to unnecessary strain or is set correctly.—S. JANES.



The detector is a small lamp house with two pieces of polarizing material. The lower one is turned to give purple light

At left, testing two spectacle mounts. The farther one is bad because the glass is strained, but the other one is all right





# new SHOP IDEAS

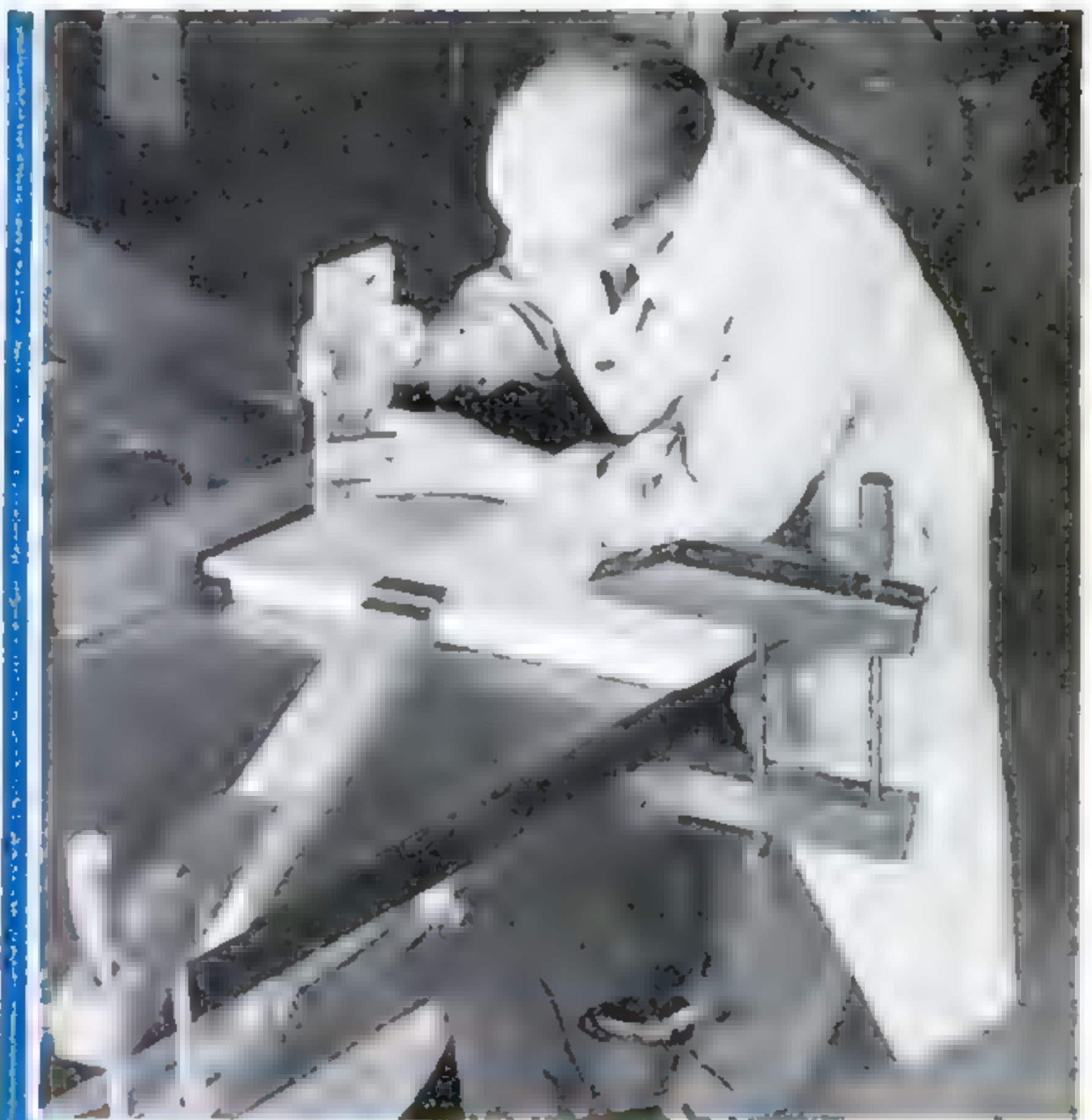


## Well-Designed Spring Guide

### INCREASES SAFETY OF CIRCULAR SAW

**S**PRING guides for the circular saw are, of course, indispensable in the woodworking shop, and the one illustrated is especially well designed for its purpose. It holds the work tightly against the fence of the machine even if the wood is badly warped, and it prevents fly-backs because the work can only move forward once it enters into the fingers of the fixture.

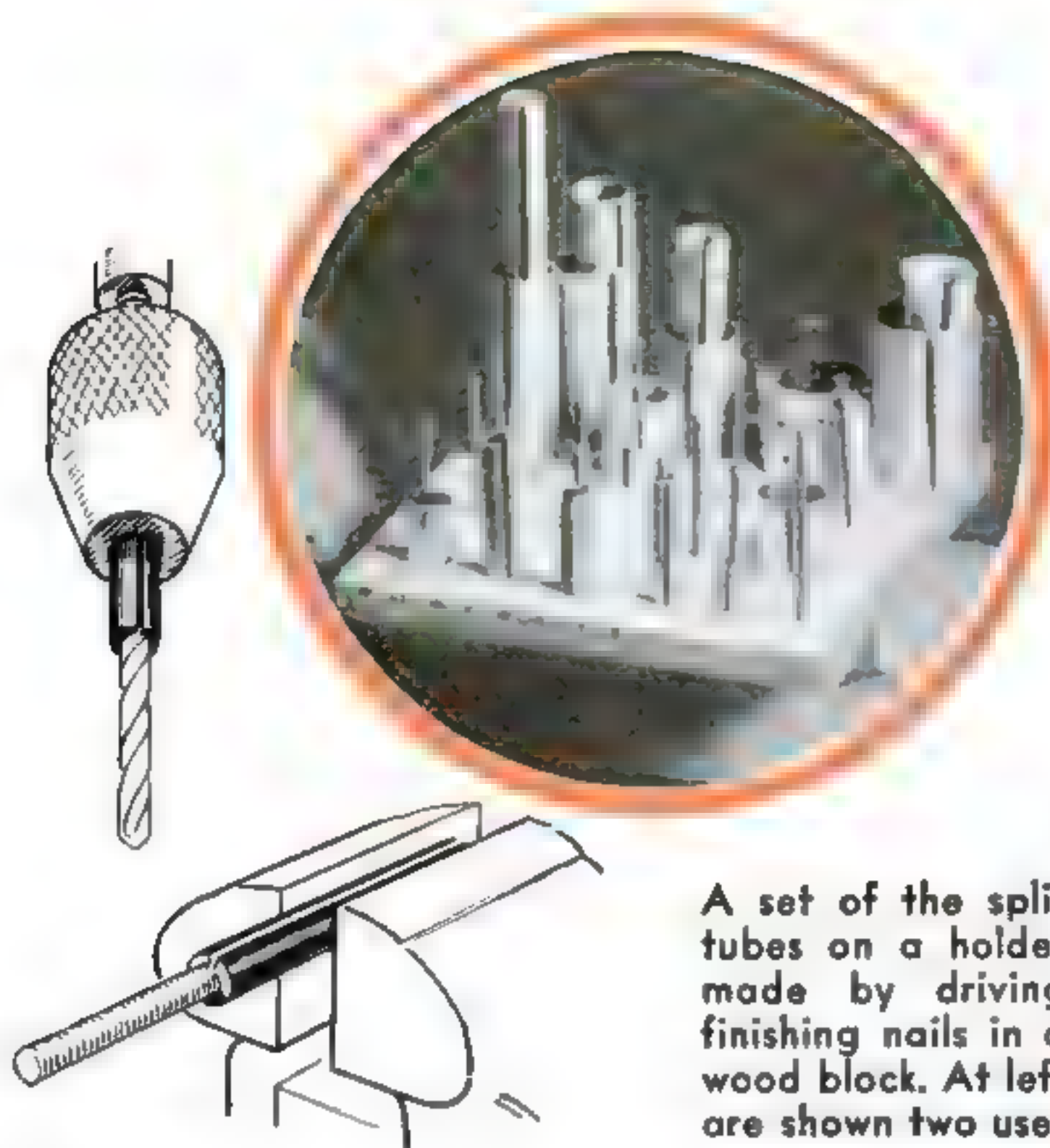
Dimensions for a large machine are given in the drawing, but they may easily be reduced. Note that the bottom corner of the spring fingers is cut away to give clearance for sawdust and small pieces of wood. This rabbet may be cut before the saw kerfs are made to form the  $\frac{1}{4}$ " wide fingers. The fixture should be braced while in use. A loose-pin hinge is used to attach the brace so that it may be removed when the fixture is stored.



The springy fingers of the guide hold the work tightly against the ripping fence and prevent any fly-backs

Assembly and detail views. Although the dimensions are for a large saw table, they may readily be scaled down to fit any type of home workshop saw





A set of the split tubes on a holder made by driving finishing nails in a wood block. At left are shown two uses

## Split-Tube Collet Chucks Serve Many Purposes

SHORT pieces of tubing, cut open down one side, form handy collet chucks for many uses. They can be used to hold the ends of broken drills or to reënforce very small drills. They will prevent damage to polished or threaded rods that have to be clamped in a vise and keep thin-walled tubes or wooden rods from being flattened by the vise jaws.—M. T.

## Gauge on Tinner's Snips Limits Length of Cut

MANY times in working with sheet metal it is desired to make a series of cuts of equal length, as, for example, when cutting a number of fan blades from a single blank. For this purpose the adjustable gauge shown below will be found useful. When it is attached to the shears, any number of uniform cuts may be made. It is adjustable and may be set to stop the cut at any place up to the limit of the shears. Make it from fairly heavy sheet metal, loosen the nut that tightens the blades of the snips, and slip the gauge in place. Set the bottom of the V-notch exactly level with the nearer blade and as far back from the point as the cuts are to be made. The gauge shown is  $3\frac{1}{2}$ " long and  $\frac{3}{4}$ " wide.



Adjustable gauge fastened to tin snips so that a number of cuts of uniform length may be made

## Handy Switch Control for Drill Press

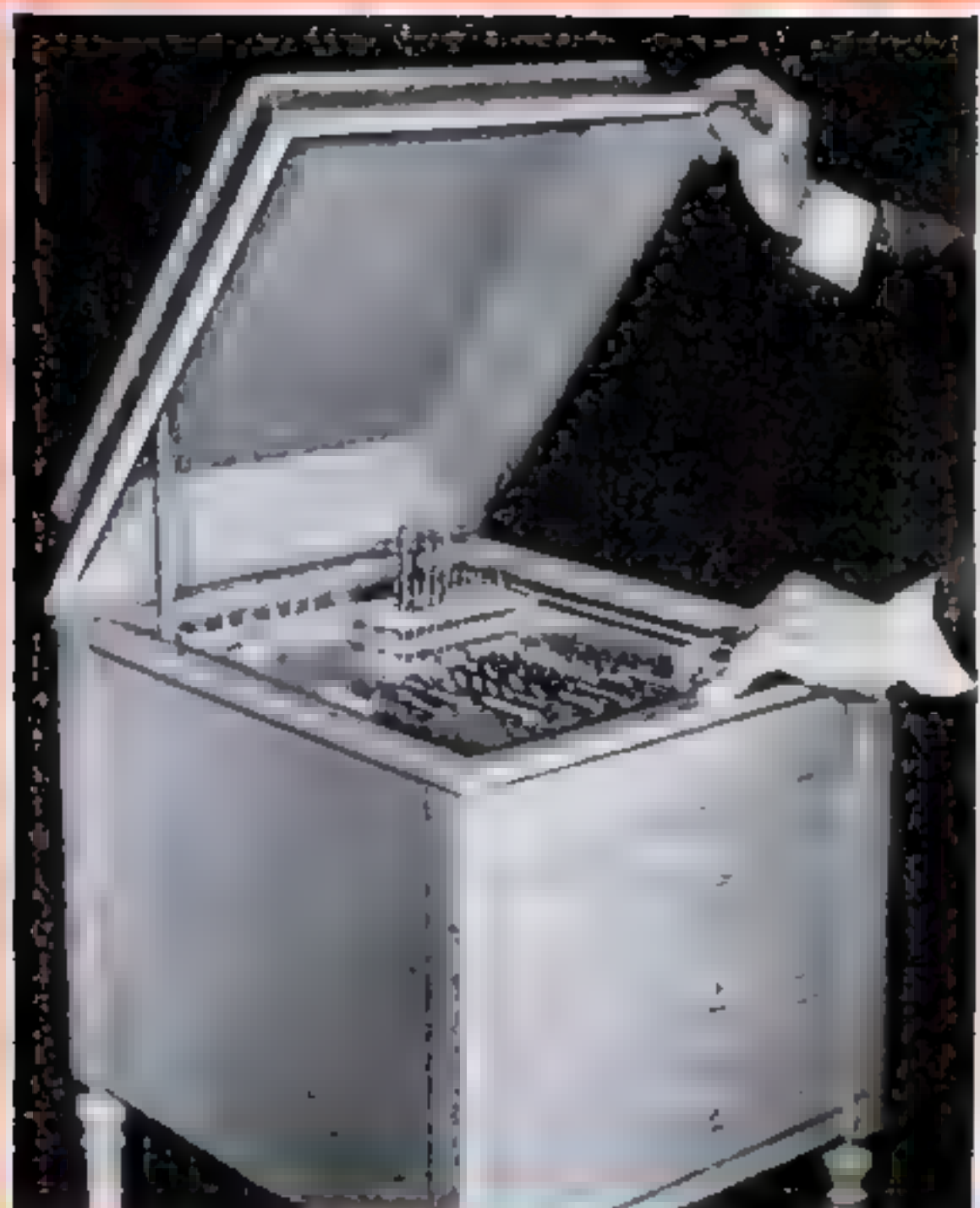
A CONVENIENT switch-control knob and safety lock may be added with very little work to a drill press of the type illustrated. A piece of  $\frac{3}{16}$ " brass rod about 2' long is bent as required by the design of the machine so as to run from the motor switch to the front of the drill press. A small screw eye is soldered to the switch to receive one end of the rod; the other end is supported in a bracket made from a piece of  $\frac{1}{2}$ " by  $1\frac{1}{2}$ " sheet brass with a quarter bend in it as shown.

To relieve the switch from any strain, a 1" corner brass is mounted on the motor as an additional bearing for the rod, and two stop collars with set screws are fixed on the rod to limit the movement. A small radio tuning knob is fastened with a set screw to the front end of



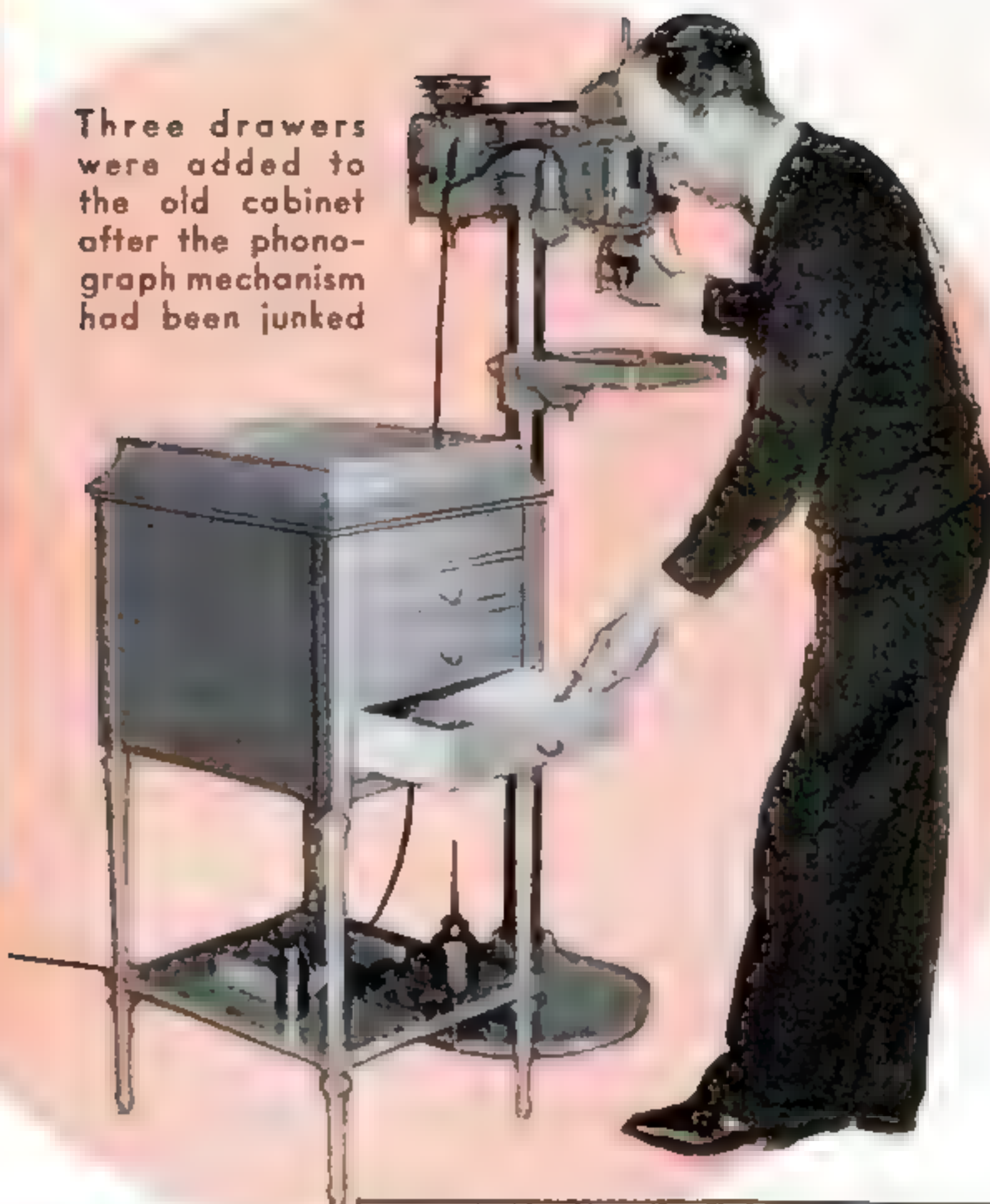
the rod. The lock is merely a piece of 1" by 3" by  $\frac{1}{32}$ " brass bent over the rod between knob and front rod support. It prevents the switch from being thrown.





Three drawers were added to the old cabinet after the phonograph mechanism had been junked

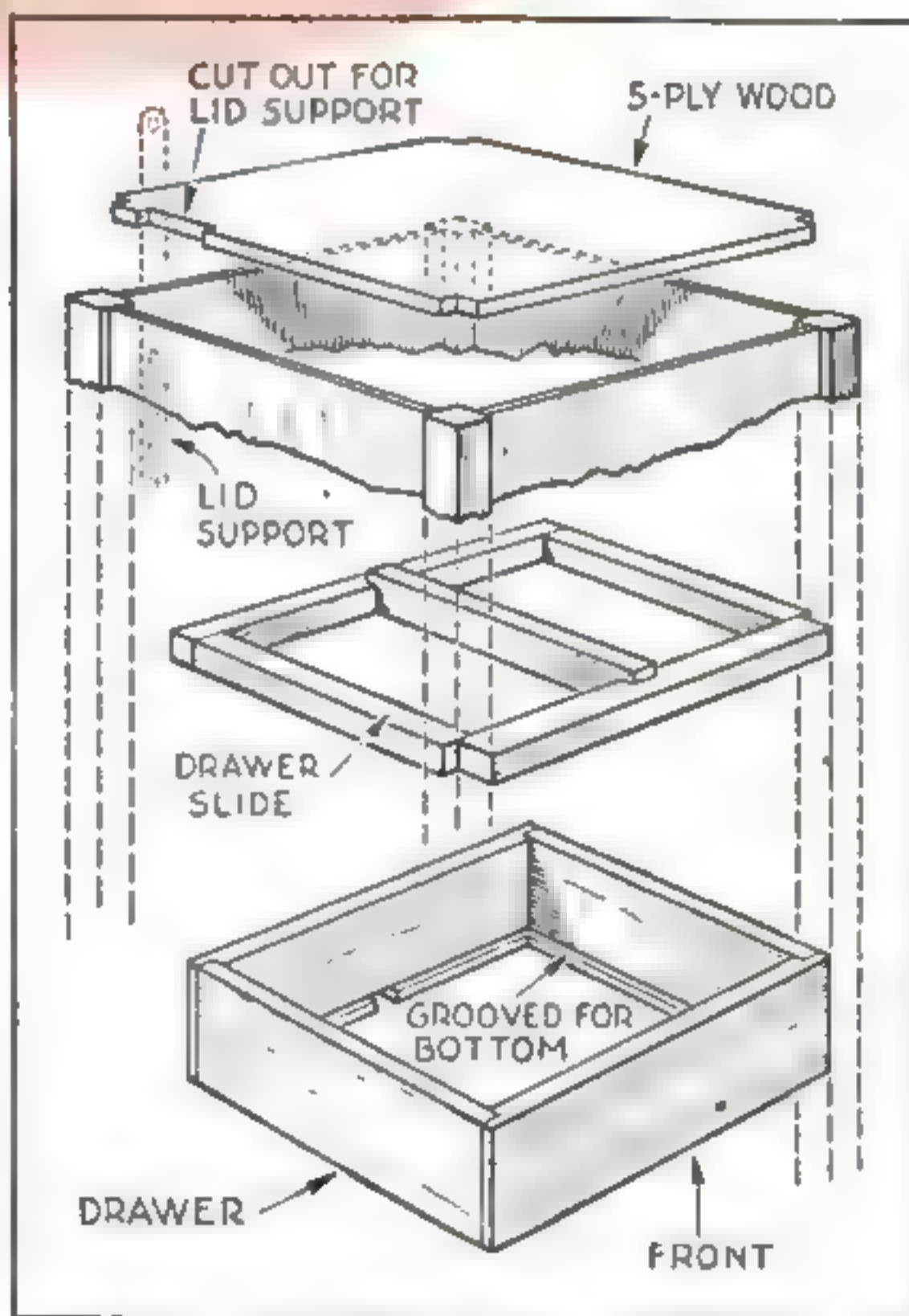
The top compartment is of generous size for drills, bits, and various other accessories that are in constant use



## Old-Fashioned Phonograph Converted into a Tool Cabinet

OLD phonograph cabinets can be remodeled into excellent tool cases. The one illustrated was bought for thirty-five cents secondhand and fitted up for use in connection with the drill press.

A cabinet that has the upper part of the legs square, as shown, is the simplest to make over. Remove the mechanism, doors, and all hardware with the exception of the lid support, and take off the lid itself temporarily. Cut a piece of plywood to fit inside the top, and nail in cleats to hold it about 2" down. The drawers and drawer slides may be built as in the drawings. The record compartment shelves will serve for drawer bottoms. Paint the whole and add drawer knobs.



How the floor of the upper compartment was inserted and drawers and their slides made

## Scales Scribed on Tinned Copper

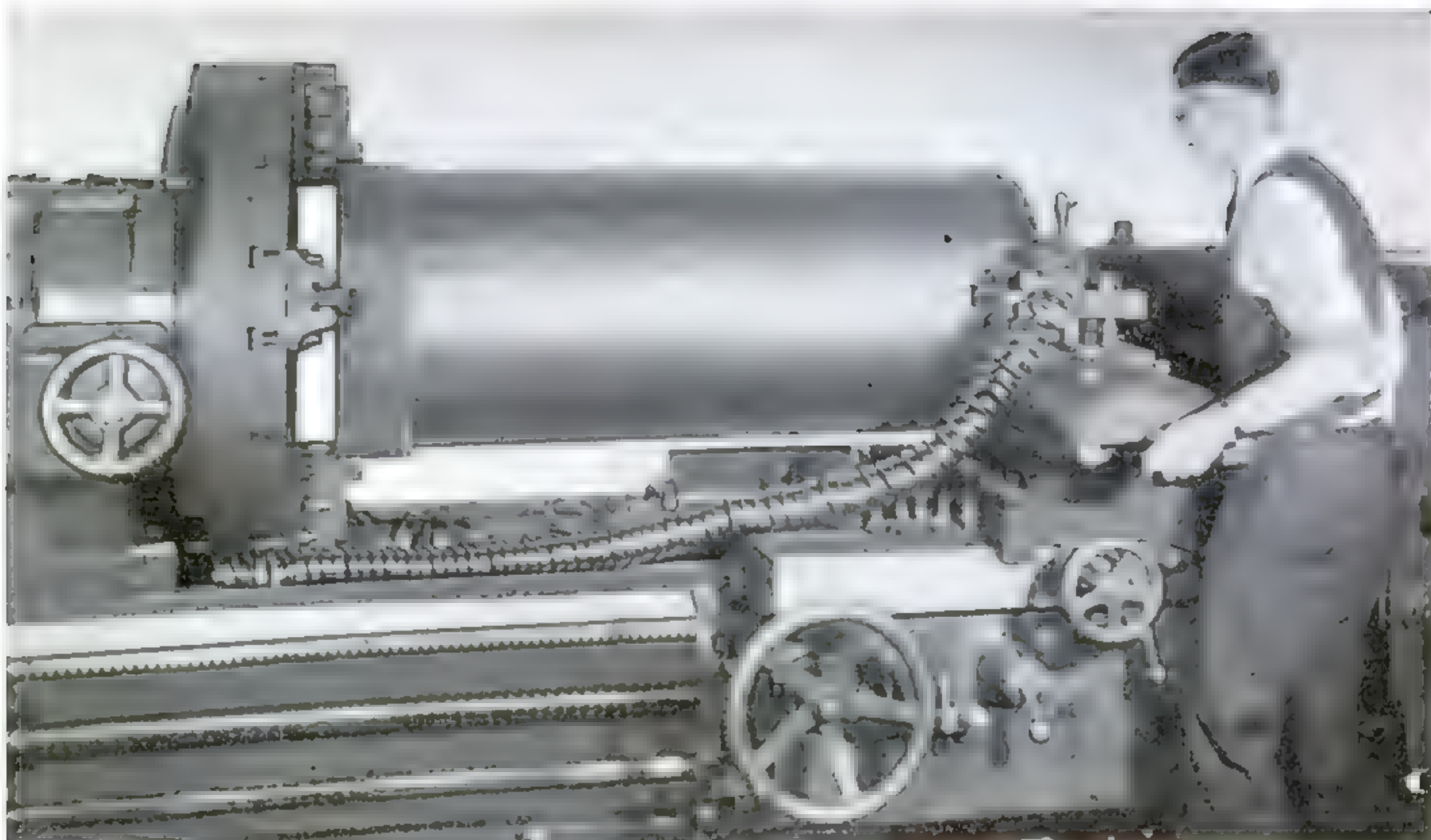
CALIBRATED scales and dials for machines, models, and various instruments, especially those of an experimental nature, are easily made from tinned copper plate. If this is not available, ordinary sheet copper can be tinned with solder by using a common soldering iron. The divisions are scribed through the tin coating so they may be clearly read as shown at the left. After the marking has been completed, polish the surface lightly with fine steel wool and lacquer to preserve the brilliance.—R. O. L.



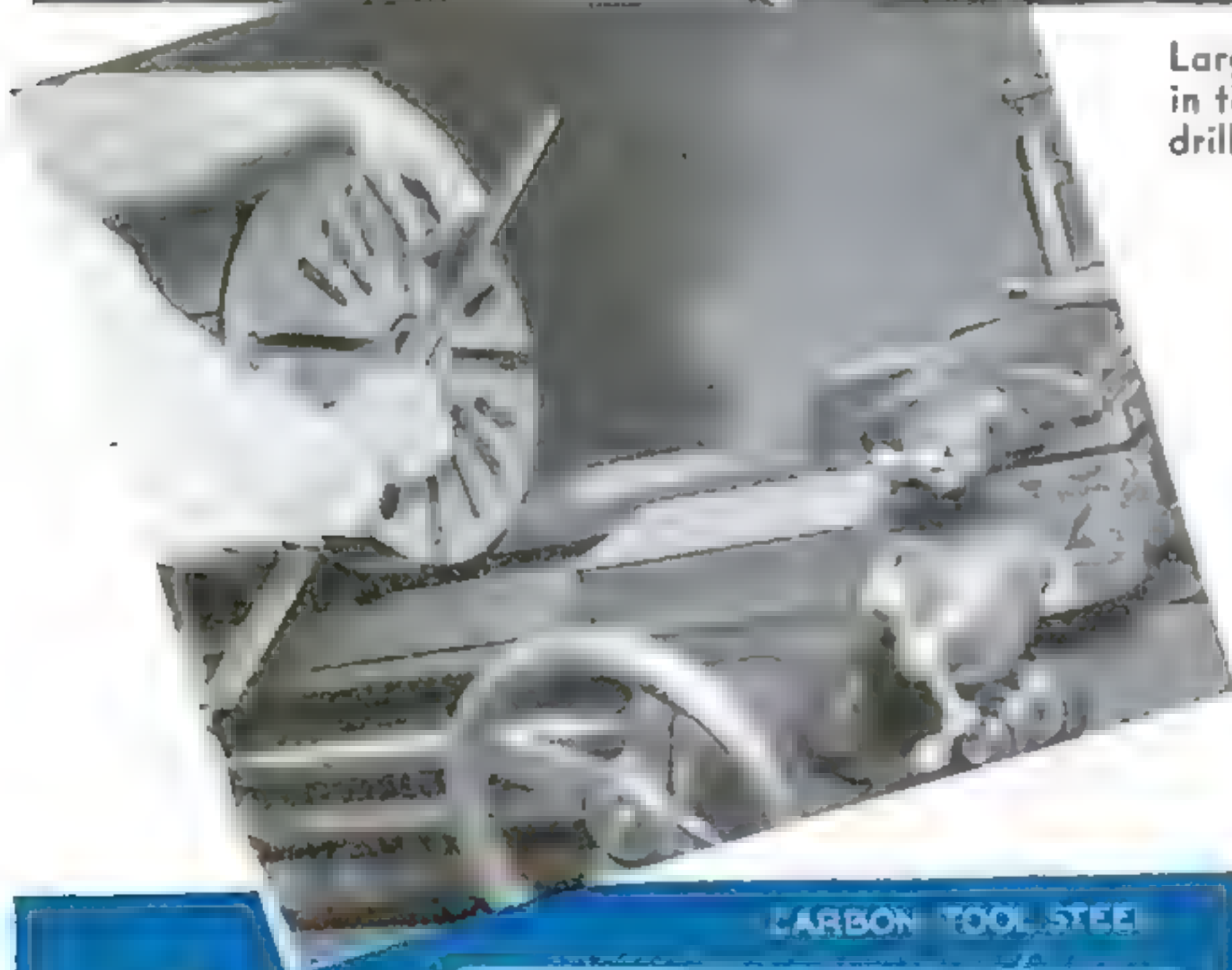


PART  
TWO

# Lathe Accuracy



Large or small, a lathe must be accurate, as in this case where the column of a big radial drill is being turned. Left, testing faceplate



**A**FTER a lathe has been checked up from the point of view of alignment, it is necessary to test the cross-feed mechanism. Work already done will avail nothing unless this part of the lathe is also in good order.

The major test, which is quite simple, relates to the faceplate. Mount the faceplate on the spindle, but make sure that contacting surfaces are clean. Now take two light cuts over the plate. Use a straightedge and a small piece of 0.001" thick paper, as shown, to see what the results are. If the surface is concave to this amount or less, it is considered quite satisfactory. On the other hand, even a minute amount of convexity is out of the picture and indicates wear in either of the dovetailed slides. Check the cross-feed slide and screw first, then the tool post and swivel slides. Gibbs and adjusting screws are provided so that it is easy to compensate for wear.



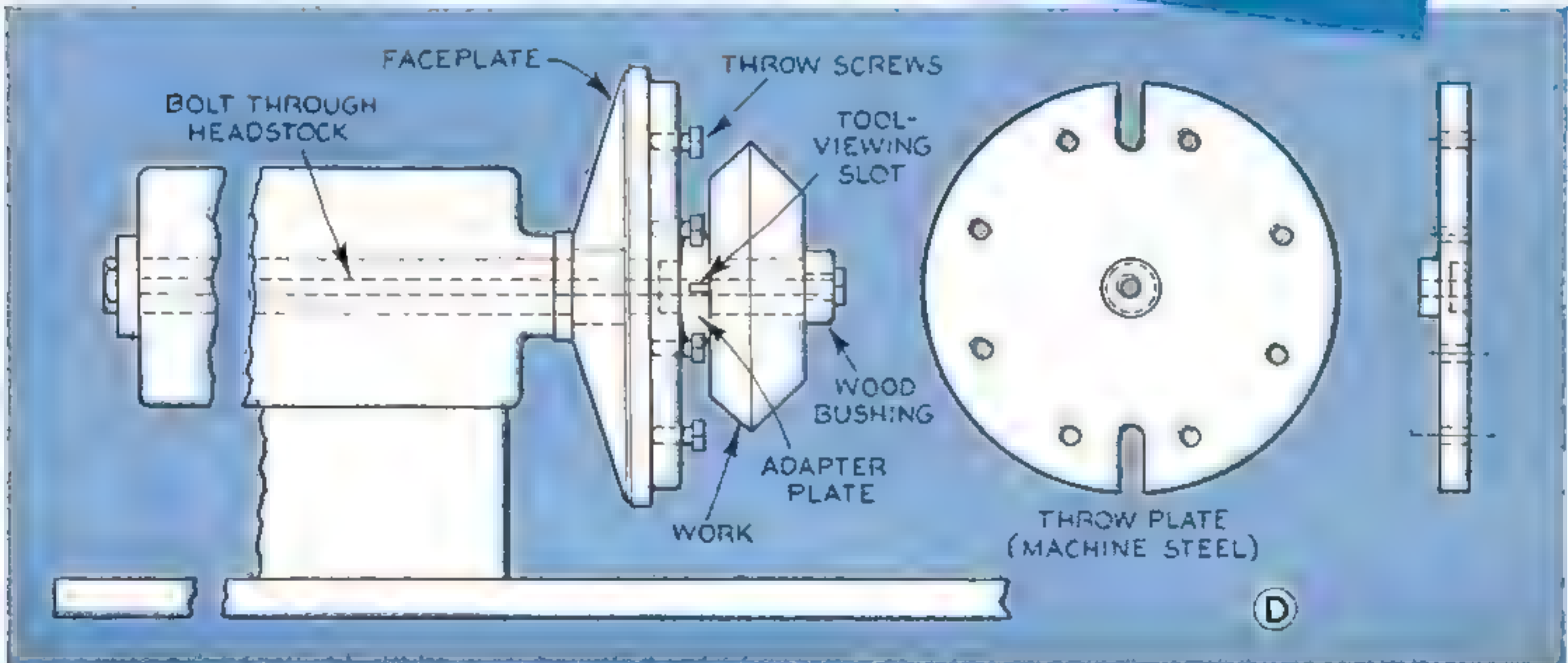
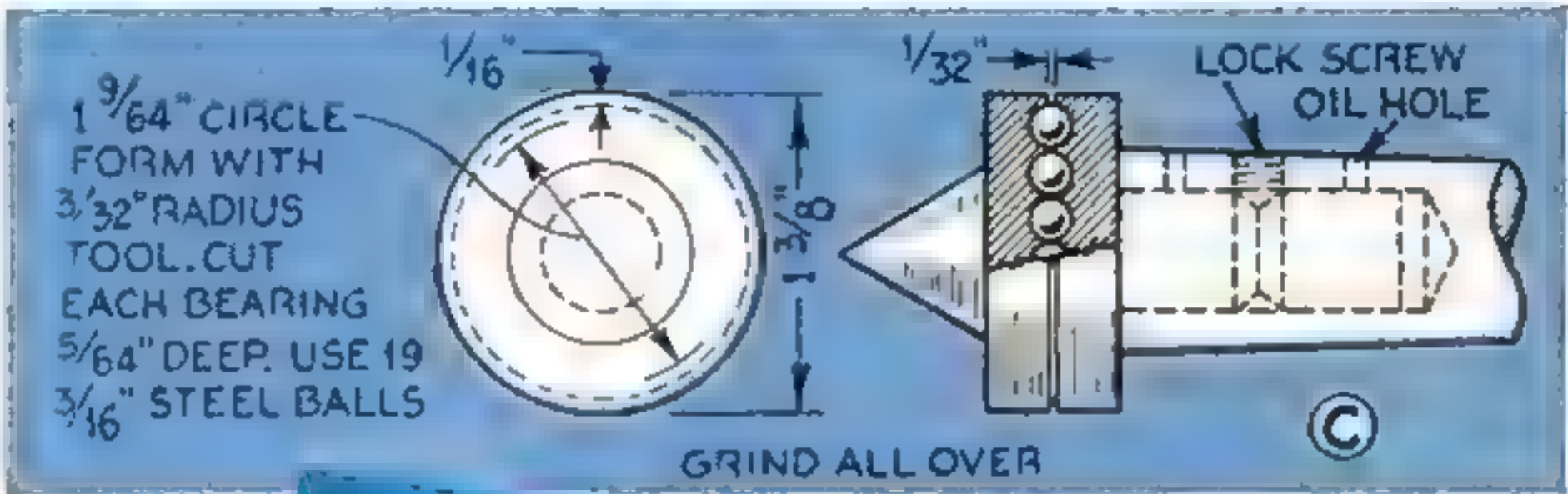


# CHECKING UP ON THE CROSS-FEED . . . CENTERS CHUCKS . . . SPECIAL THROW PLATES . . . TAPERS

Now let's consider the various accessories used with any lathe. It is logical to start with the centers because considerable unsatisfactory work is regularly traced to defective ones. Lathe centers should preferably be ground all over, although accurately turned and hardened centers are safe to use. Many lathe operators use soft headstock centers so they can occasionally true them by turning as shown. This idea is all right if the point is turned precisely radial; however, the conventional method is to prickpunch mark the center and spindle so as to align them at will.

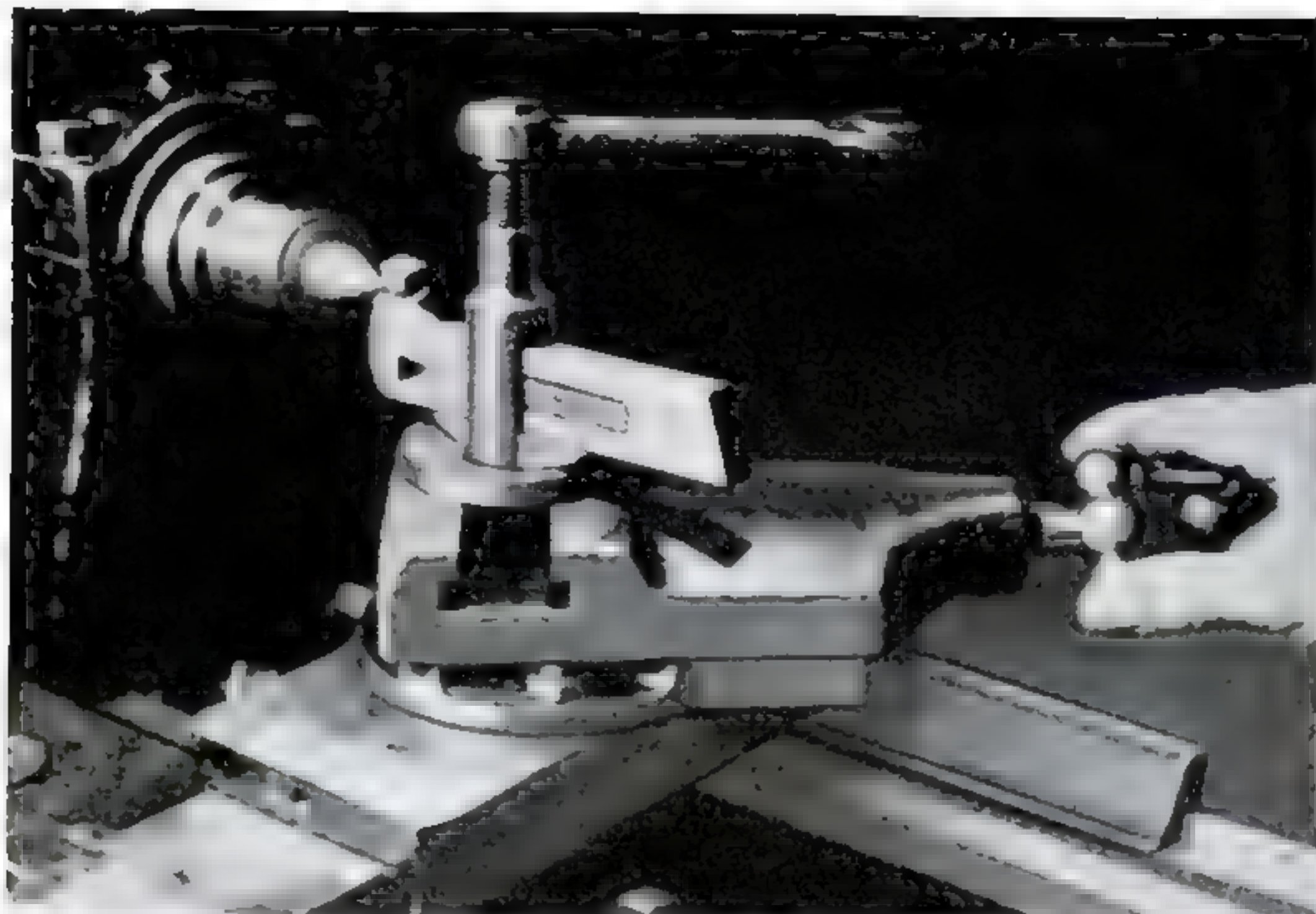
Tailstock centers with high-speed steel inserts, made as shown at A in the drawings, are particularly recommended for long life. Very serviceable centers can also be economically made from discarded high-speed steel end mills, as at B. Grind the shank to a Morse taper before cutting off, or use with a combination taper collet.

Some heavy work or work with large center holes requires live centers. These need not be expensive unless they are used constantly. Ball-bearing live centers machined from good carbon steel, then hardened and ground all over, as at



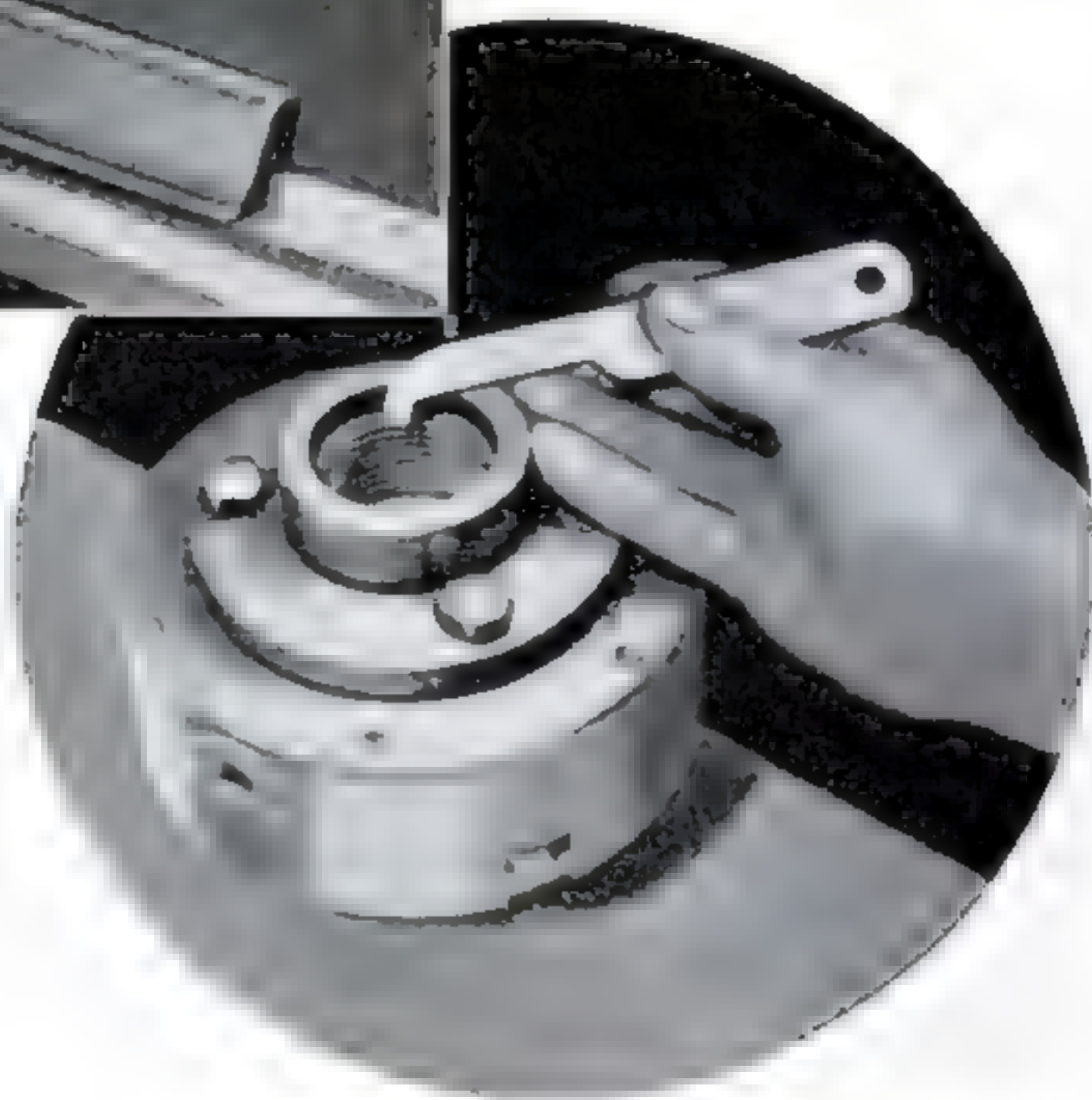
Suggestions for ball-bearing live centers, a parallel-gauge fixture, and a so-called "throw plate." On the facing page is shown a tail center with high-speed steel insert and one made from a discarded end mill





If you prefer to use soft centers in the headstock, it is a good idea to check up by means of an indicator after they have been trued up by turning as at the left

Before a chuck is mounted, it is important to see that the threads are clean. An easy way to do this is to use a small tool having a point shaped to match the threads as illustrated below



C, will handle a substantial weight. In fact, centers like the one shown have been used to turn 250-lb. crankshafts.

Good chucks play their part in accurate lathe production. Keep them right by dismantling them often and cleaning all parts in a gasoline or kerosene bath. Three-jaw universal scroll chucks should carefully be trued with a plug gauge after reassembling, but at times the jaws have to be ground to establish the desired concentricity. Always clean the threads of a chuck before using it. For this purpose an improvised tool may be used as shown in one of the photographs.

Work of irregular shape occasionally comes along and is of such a nature as to require extra truing facilities. In other words, some parts have to be accurately bored or rebored and trued to lateral as well as radial accuracy. The addition of a so-called "throw plate," shown at D in the drawings, will solve such problems. This plate is set against the regular faceplate and may be made slightly smaller than the latter. Small adapter plates of various diameters are made to suit the run of the work and set between the throw plate and the piece being trued. A variety of wood bushings are required to fill the gap between the bore of the work and the long bolt that holds the assembly together. These bushings also afford convenience in truing.

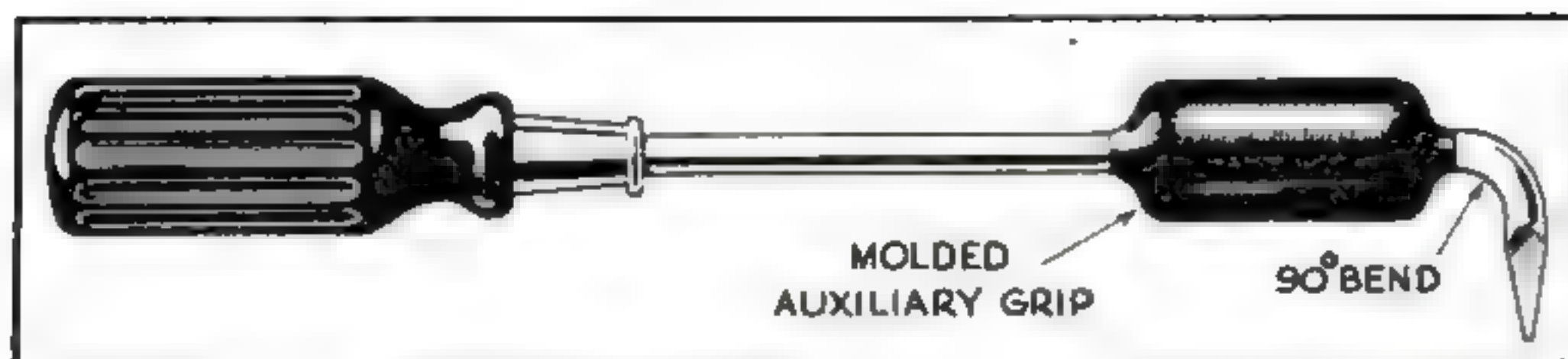
The procedure is first to true radially, then correct lateral errors with the throw screws. A slight movement of one or two screws against the faceplate—that is, those so located as to throw over the low spot—will quickly give the desired results. The piece is then securely held with a bored strap and two bolts, and the job is ready for boring or grinding after removing the long bolt and

wood bushing. This outfit is, of course, suitable to use in any internal or universal grinder.

The turning and boring of tapers demand that the tool cut precisely radial as no taper can be accurately generated otherwise. All internal tapers should be finished with reamers unless intended to be ground. When finished by boring, final results can, however, be had by a lapping operation. External tapers predominate by far because such work includes shanks of all descriptions. Female taper gauges are expensive and require Prussian blue for testing, and the whole procedure is slow and inconvenient. A parallel-gauge fixture as shown at E is advantageous since it eliminates the female gauge and expedites work to a marked degree. The tool can usually be made from odds and ends except for the two parallels. These must be hardened and ground all over.

After all, the old saying, "A stitch in time saves nine," applies to a lathe or any other machine tool. Keep your lathe clean and well lubricated at all times. Watch for that first 0.001" play because it soon multiplies itself disastrously.

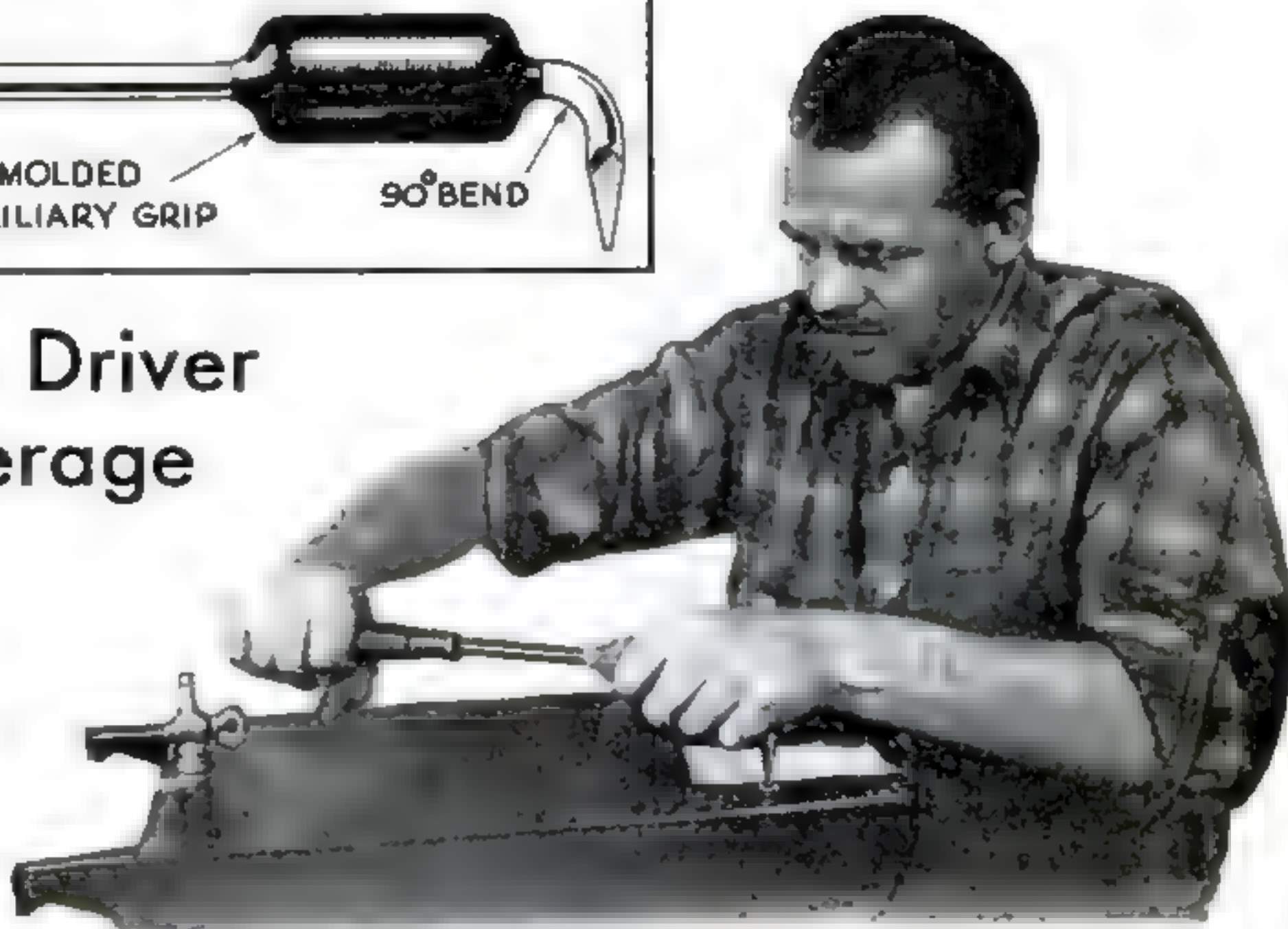




## Heavy-Duty Screw Driver Gives Great Leverage

A HEAVY-DUTY "persuader" for stubborn screws can be fashioned from a large screw driver. An inch or so from the tip, apply a narrow blowtorch flame and heat the shank for a few moments. Do not permit it to get so hot that the temper of the whole tool will be drawn. This heating is merely to allow the tip to be placed in a vise and bent to a 90-deg. angle.

The auxiliary grip is molded from a composition formed by heating half a cup of thin glue, then adding tissue paper until a thick



paste results, after which chalk (whiting) is added until the mixture is a stiff dough. In three or four days this will dry hard and can be sanded or carved to provide a smooth grip.—K.F.K.

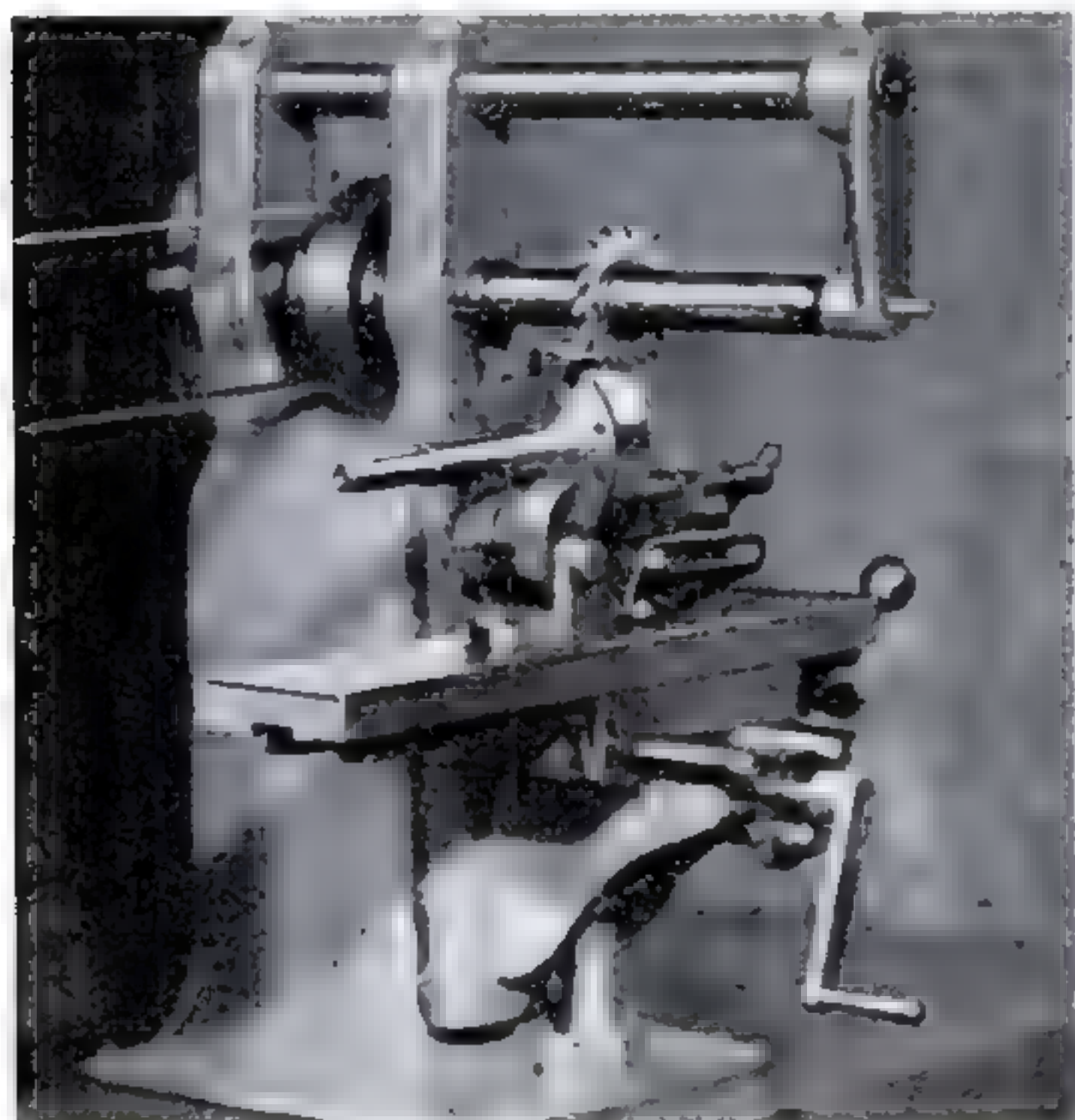
## Inserted-Tooth Milling Cutters Made at Low Cost

INSERTED-TOOTH milling cutters of various sizes for home workshop use may be made economically by the following method, especially if discarded high-speed steel teeth can be obtained from a machine shop. Teeth that have been ground down too small for their usual-size cutters will serve the purpose.

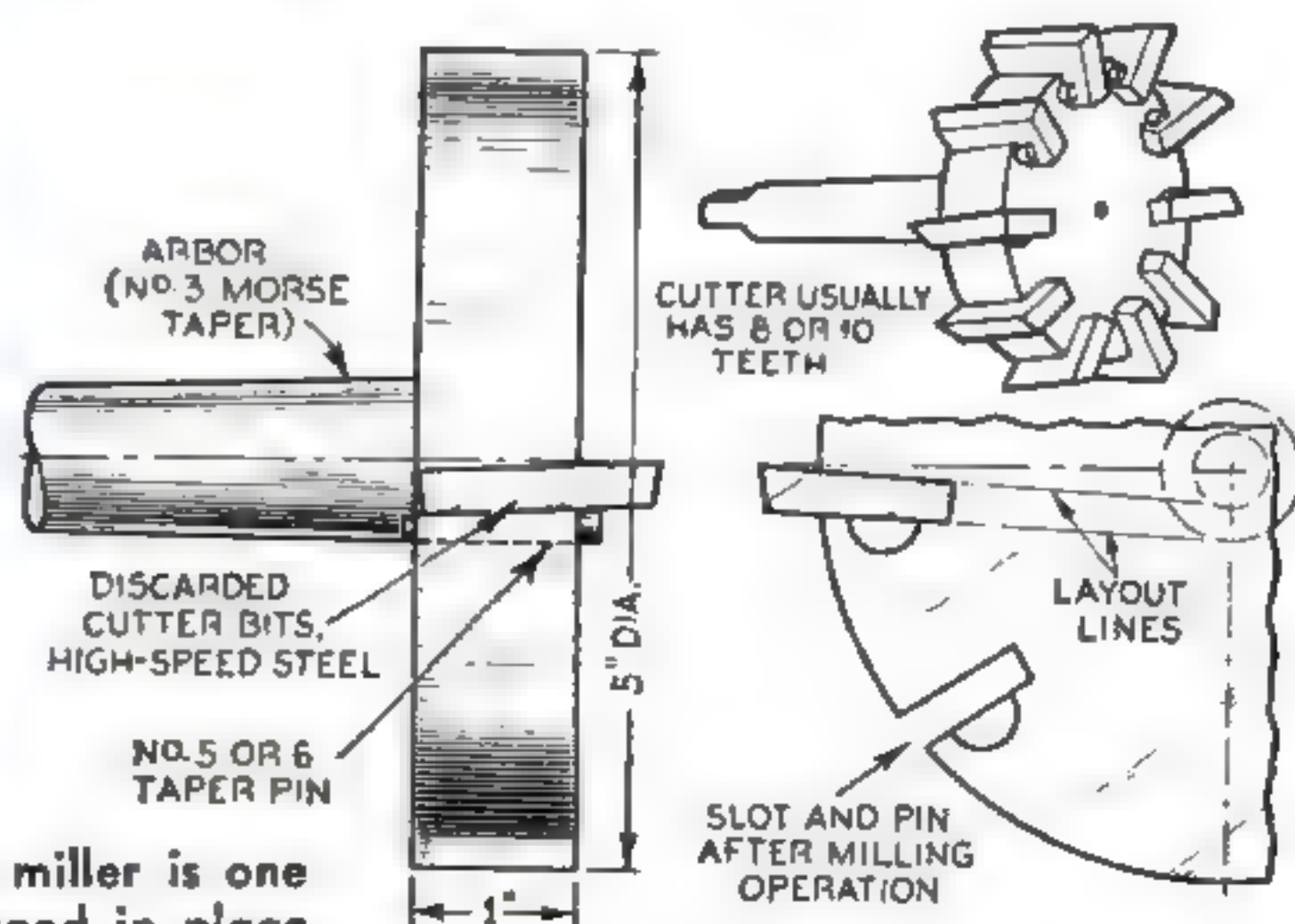
A steel disk is attached to a tapered shank arbor. The blank is then set in a drill press

and holes are drilled at the proper angle so that taper pins may be inserted as shown. The hole for each pin is reamed to such a diameter that when the pin is driven in snugly, the small end is flush with the arbor side of the blank. With these pins in position, the unit is placed in the milling machine and the blank is swung around at the proper angle and off center a sufficient amount to give the desired rake; then the slot is milled to the proper width for the inserted tooth. This slot cuts the taper pin in half.

After this machining operation, the teeth are inserted in the slots and the half taper pins are driven in farther to bind the teeth. It is then necessary to grind the cutter, which almost any machine shop will do at a reasonable figure.—E. W. CLEM.



A cutter blank set up for machining the slots. The miller is one Mr. Clem constructed. Right, how the teeth are pinned in place

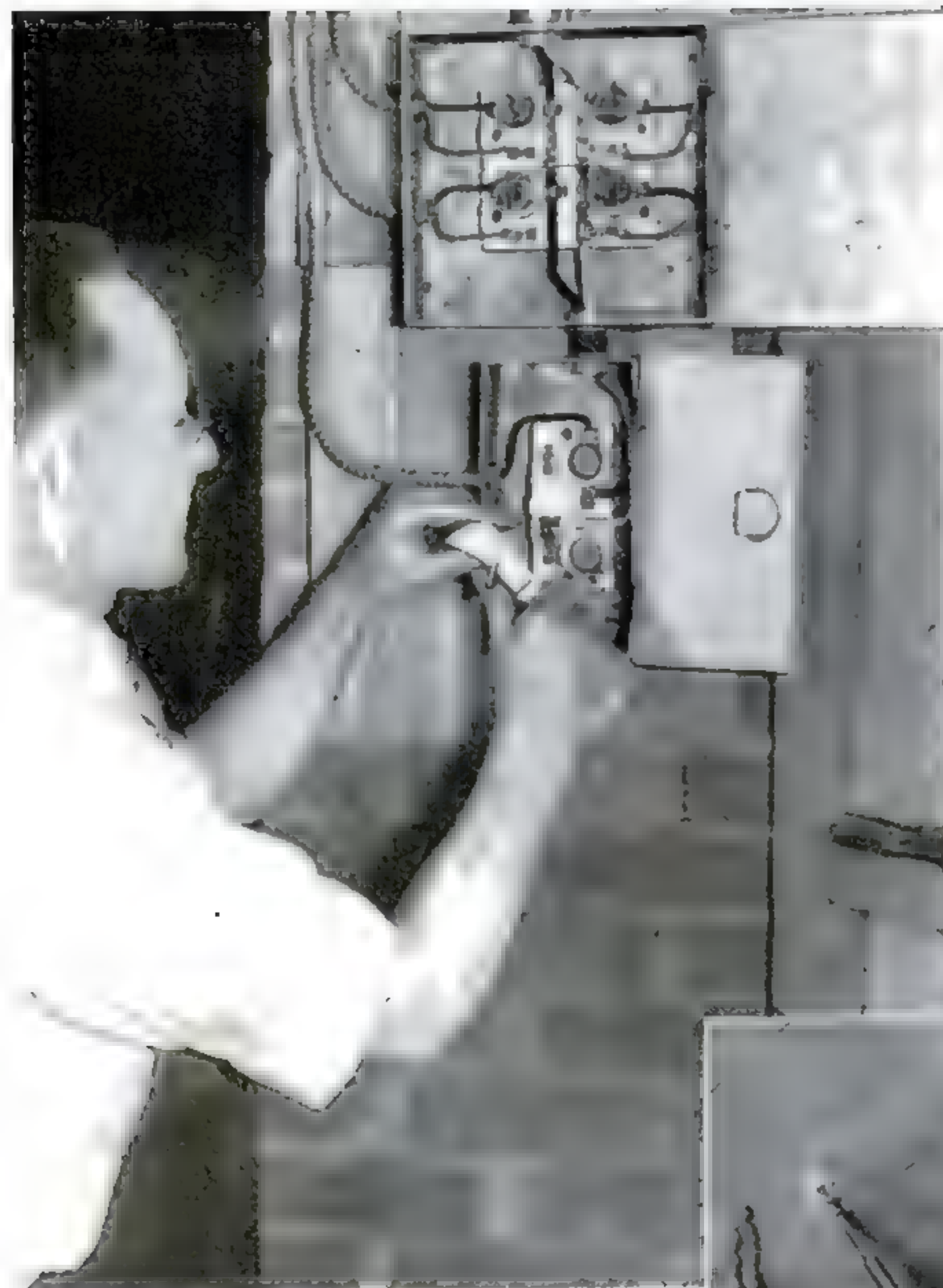




# WIRING

LACK of a sufficient number of permanent base or wall outlets for electric lamps and appliances is the cause of the hazardous misuse of cords in many homes, yet it is not at all difficult to install plug outlets, especially on the first floor. Every main room should have at least two, and the living room requires from four to six, depending upon its size. The accompanying illustrations show some of the problems involved in the installation of new outlets.

The Electrical Code allows appliances rated up to 12 amperes (1,320 watts) to be used from ordinary outlets that are wired to common branch circuits with No. 14 wire. However, we cannot



NEW DOUBLE CUT-OUT and box added to old cabinet with nipple, lock nuts, and bushings. Wire of same size as submains (in this case No. 8) is spliced to the original wires so the joints come between the terminal clamps. Solder the splices. If the meter is nearby, it is better to use new submains long enough to reach the box without splices. A double cut-out was used to provide for a spare circuit. Sometimes the fuse box has room for a new cut-out

BEFORE DOING ANY CUTTING upstairs, drill a hole up into the partition to make sure it is possible to fish up the BX. The partition is located by measurements and by observation. Double timbers and heavy girders are usually indications of a partition

By  
**HAROLD P.  
STRAND**

•





# CONVENIENCE OUTLETS

have in the circuit a load exceeding 15 amperes at one time. This means that we must not plug in too many appliances together and expect the 15-ampere fuses to hold.

If you have an appliance rated at over 12 amperes and up to 15 amperes (1,650 watts), the Code requires that you wire the circuit with No. 12 wire and fuse it for 20 amperes. This circuit is also useful when several smaller appliances are to be used at one time. For instance, we could plug in three 660-watt units such as a flat iron, toaster, and grill, drawing a total of 18 amperes. They

would blow the fuses used on the first circuit.

The 20-ampere circuit is well adapted to outlets in the kitchen. Starting from a separate cut-out in the fuse box, a line of No. 12 BX or two No. 12 rubber-covered wires in steel tubing, if local rules demand it, are carried up to an outlet for the iron, another for the electric refrigerator, and a third over the table, if placed beside the wall, for a toaster. In addition, it might be desirable to include a mixer outlet near the kitchen cabinet; also, near one of the windows, an outlet is handy for an exhaust ventilating



BRICK FIRE STOP, if encountered, can usually be knocked out enough to pass the cable by using a long iron rod and a hammer, or a long cold chisel. There is rarely more than two layers of brick above floor level

THE FEED CABLE from fuse box is No. 12 BX to allow use of 20-ampere fuses. Junction box is for connections to extra outlet in kitchen if needed. Joints are made by twisting bared ends of all black wires together, and making another group of white wires. Solder and use rubber and friction tape. Add a blank cover on the box

Below, attaching trimmed end of BX to the snake wire. The other end of the snake has been caught by another wire and fished out of the wall upstairs







MEASUREMENTS disclosed that blocking had been used in the wall at the chair rail. This was bored through with the extension bit through the outlet hole in the wall. Care is needed not to break the plaster

BX CABLE is pulled up to the outlet, where a switch box is installed. Use red fiber bushings on all ends of cable, and clamp the armor in the box. A duplex receptacle is then connected in the usual way

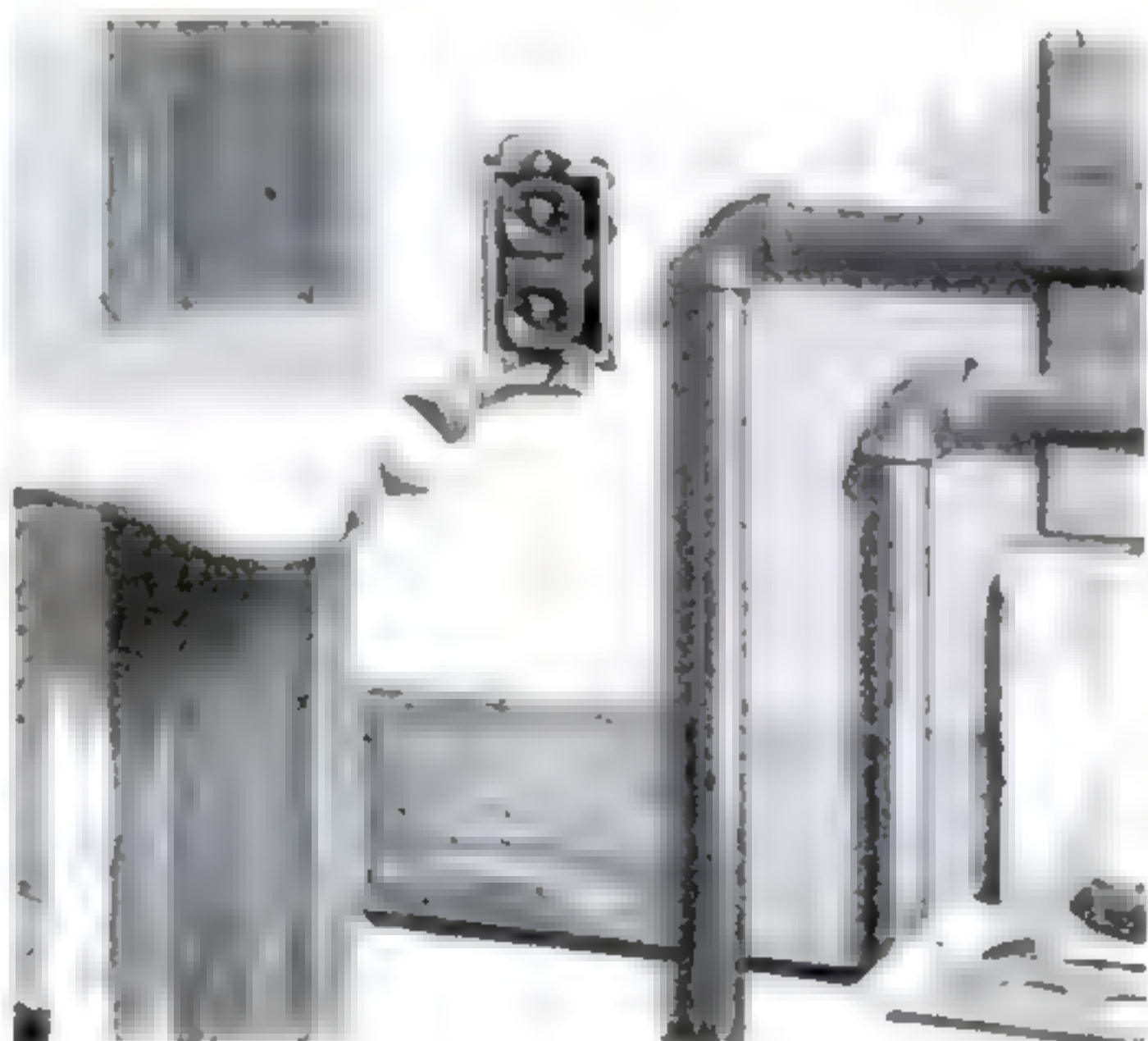
fan. A circuit is thus available to plug in any one appliance up to 1,650 watts (such as a large mangle) or for using a number of smaller devices together up to the capacity of the 20-ampere fuses.

In running the circuit across the cellar to the kitchen, it might be a good idea on the way to pick up a plug in the dining room and allow the use of table appliances from this circuit.

Appliances in excess of 1,650 watts and up to 2,200 watts must be used only from a circuit wired with No. 10 wire and have 20-ampere receptacles installed in the wall or base.

When acquiring a new appliance, examine the name plate and note its rating in amperes or watts. The wattage is found by multiplying the volts (usually 110) by the amperes.

Be sure to have all wiring inspected by your local electrical inspector.



## How to Resharpen Hair Clippers on an Oilstone

HAIR clippers, both hand and machine, must be sharpened correctly or they will be irretrievably ruined. The first requisite is a large oilstone with two grades of grit—medium and fine. If an old one is to be used, bring both surfaces to a perfect level by grinding on a discarded piece of auto windshield, using sand and water for an abrasive. After all low spots are removed, the stone should be washed clean and oiled.

Take the hair clippers apart completely, removing the guide pins and all screws. If springs are broken, they can be replaced by new, and replace all worn screws. Next lay the blade upon the stone with cutting side down and rub it back and forth along the surface, also giving it a rotary or side-to-side

motion, to avoid grooving the stone. About 100 strokes will be enough for an ordinarily dull blade, but as many as 300 strokes may be needed. Use only moderate pressure and never grind the blade with the stone dry. Sight along the surface of the blade, and the sharpened portions will appear somewhat dimmer than the dull parts. Finally, finish with the finer side of the stone, using not over 100 strokes.—GEORGE PARKE.

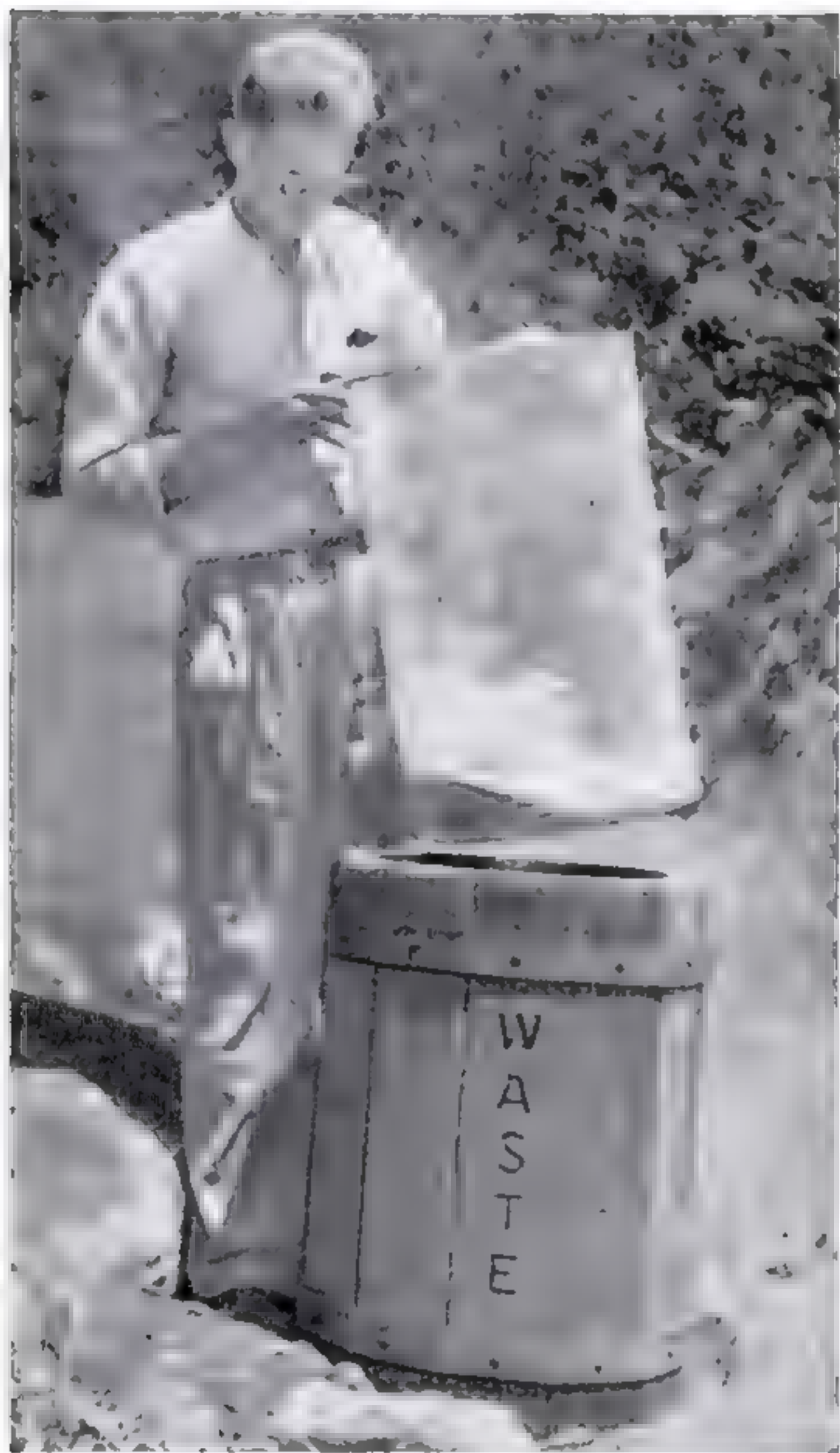
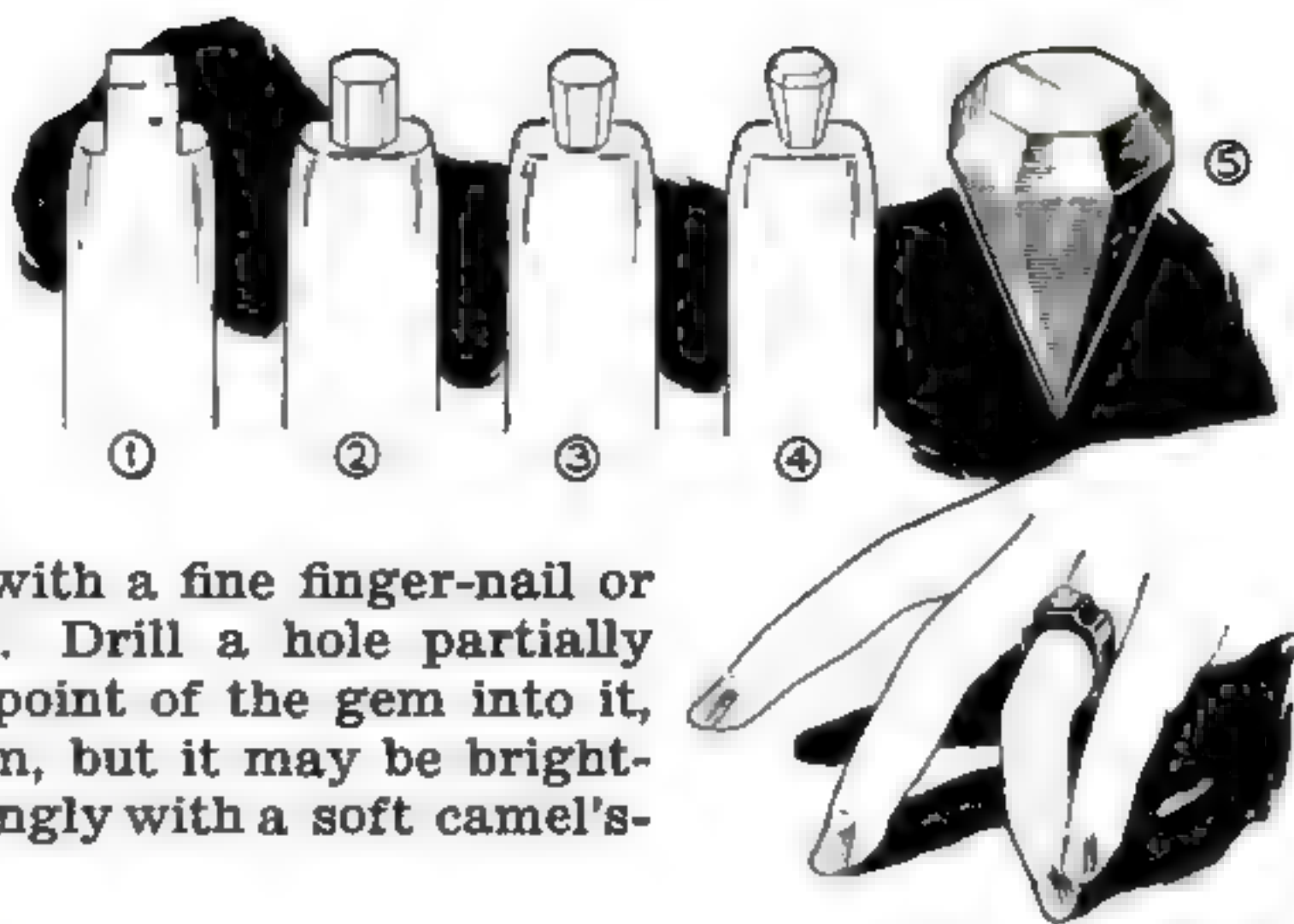
## Penetrating Oil for Shop Use

FOR loosening rusted connections on plumbing jobs and similar work, a cheap penetrating oil can be mixed from one part used motor oil and three parts kerosene.—L. C. T.



## "Gems" for Celluloid Rings Cut from Old Toothbrush

**R**INGS made from old toothbrush handles or scraps of celluloid may be ornamented with "gems" of the same material. Either transparent or solid colors may be used, the gem being formed as shown on the end of a fairly large piece. The top edges are beveled with a fine finger-nail or ignition file, and the sides then trimmed off. Drill a hole partially through the ring, fill it with acetone, set the point of the gem into it, and let it dry. Do not attempt to buff the gem, but it may be brightened by painting it with acetone, applied sparingly with a soft camel's-hair brush.—E. E. YOUNGKIN.



## Rustic Outdoor Trash Can

**F**OR picnic grounds, camps, or parks, this rustic trash holder is much less unsightly than the ordinary types of painted cans. It is made of twelve wooden staves held together by two hammered iron bands. Short, square-headed lag screws pass through holes in the bands and into each stave. The inner container, of heavy wire screen, is lifted out to empty the contents.—ELMER CROOK.

## Protector Shaped from Tin to Guard Injured Finger



**W**HEN the tip of a finger is badly injured, it remains sensitive for a long time and hurts when accidentally bumped. To protect it, cut a piece of fairly heavy tin to the shape shown and bend it to fit over the initial dressing. Bind the metal jacket on with surgical tape.—F. R. JOHNSTON.

## Sandpaper Cutting Gauge

**S**ANDPAPER can be divided into half and then quarter sheets quickly and neatly by making the cutting gauge illustrated below. A 10" twenty-four tooth hack-saw blade is fastened to the outward-beveled front edge of the board, with the teeth leaning in the same direction you will face while cutting the paper. The teeth should extend at least 1/16" above the top corner of the board.



The block is 6" by 9 1/4" with stops at the back for tearing sheets in half, and another for quartering



# Hints for Beginners

Join in the Fun of Experimenting at Home!  
This Article Tells How Easy It Is to Start

By RAYMOND B. WAILES



Easily made test-tube rack, with wire bracket for filtering

**I**F YOU have been following this series of articles for some time, you probably have already set up a more or less complete chemical workshop in which to carry on your experiments. However, there is always a new crop of beginners coming along—newcomers who would like to join the fun and who need some simple advice on equipment and working methods. Old-timers surely won't begrudge this space to help others get started in the fascinating pastime of amateur chemistry—and perhaps their own memories will be refreshed with a pointer or two.

Let's suppose, then, that you are starting from scratch—and would like to have a place where you can perform "magic" tricks with chemicals, test household preparations, and carry out a great variety of beautiful and spectacular chemical experiments. Where do you start, and how?

First, you will want a corner of your home where you can permanently arrange your paraphernalia, out of the

way of others. You shouldn't have to put up with the inconvenience of using the bathroom or laundry as an improvised laboratory—even if the rest of the family are broad-minded enough to let you! The attic, the cellar, or a spare room will give you a place where you can work undisturbed, and leave equipment for an interesting experiment set up as long as you wish. You can also use part of the garage, but solutions will have to be protected against possible freezing in cold weather.

In many ways, the basement makes the best choice. Gas, the perfect laboratory fuel, can be tapped from the pipes here and led to your chemical bench. Usually electricity will also be available. The ideal home laboratory would be one supplied with gas, electricity, and running water. If necessary, however, you can get along without them. Instead of a gas-burning Bunsen burner, for example, you can use an alcohol lamp for heating test tubes and flasks and for



Amateur-chemistry outfits like this offer the beginner a good start toward establishing a home laboratory. You can purchase either an assortment of chemicals alone, or a kit that also includes test tubes and other paraphernalia



# in Amateur Chemistry



Water supply—a wash bottle for dispensing small amounts of water, and a siphon jug

bending glass tubing. Electric heat will also serve. Where high temperatures are called for, a gasoline or alcohol blowtorch may be used.

Even if it is nothing more than a packing case with a board nailed on for a shelf, you will need some sort of a chemical workbench. Once you have caught the "bug" of experimenting with chemicals, you will aspire to a more commodious piece of laboratory furniture, and you can easily make it for yourself. An old kitchen table, or a new one that you can buy cheaply unfinished, makes a first-class foundation for a chemical bench. On this base you can attach substantial shelves, bookcase-fashion, to hold your stock of chemicals and a few pieces of laboratory glassware that you use most frequently. It is a good plan to construct three shelves, five inches wide and of seven-eighths-inch stock, running along the back of the table. Supported by uprights of five to six-inch width, from the same stock, the shelves may be four feet long without sagging when filled with chemicals. Tallest and heaviest bottles go beneath the first shelf, which should be eight inches above the table top, while six-inch spaces suffice between the upper shelves. Two coats of battleship-gray paint will enhance the job. Pegs that may be added for holding and drying flasks, as shown at the right of



Here's a typical amateur chemist's bench. The base is a kitchen table, fitted with homemade shelves, rack for siphon jug, and a drain for waste

the workbench illustrated, should be left unpainted.

If you lack a supply of running water, a substitute may be improvised by fitting a gallon jug as a siphon. Insert a two-hole stopper carrying a short length of glass tubing as an air vent, and a longer section of tubing that reaches to the bottom of the jug. To the latter, attach rubber tubing and a pinch clamp. Set the jug on a shelf above your bench, and you can draw off water as needed by squeezing the pinch clamp. Smaller quantities of water may be dispensed from a "wash bottle," a useful aid described in a later paragraph.

A gallon crock, or a metal pail with several



interior coats of paint, will serve as a receptacle for waste. Spent solutions, used filter papers, burnt matches, and cork borings may be thrown directly into it. An added convenience is a drain made by mounting a funnel, or the inverted top cut from a large bottle, at the side of the bench. With rubber tubing leading to the waste bucket, this makes a handy sink for pouring off liquids.

What makes a suitable assortment of chemicals and apparatus to start your experiments with? Often, a novice at stamp collecting makes a good beginning by purchasing one or more inexpensive "packets" containing a large, mixed collection of varieties. Likewise, there are excellent chemical "sets" or "kits" on the market that provide a beginner with a representative variety of materials at very low cost. You can purchase either an assortment of chemicals alone, or a kit that also includes such permanently useful laboratory accessories as test tubes, test-tube holders, an alcohol lamp, and a beaker or flask, together with a tripod for heating its contents.

If you are assembling your apparatus separately, your principal needs in your first experiments will be a number of test tubes, a test-tube holder for handling them above a flame, and some kind of a heater—a Bunsen burner, alcohol lamp, or electric stove. Test tubes four to six inches long, and half to three quarters of an inch in diameter, are good standard sizes. Useful items of equipment also include beakers, flasks, glass funnels, a graduated cylinder or two, a test-tube rack, a porcelain crucible, an evaporating dish, and an assortment of cork stoppers, cork borers, and glass tubing. A small photographic balance, preferably with gram weights, will also come in handy for weighing out chemicals.

Of course you don't have to buy all this at once, but can add as you go along. Many interesting and practical experiments require only a test tube or two and a few inexpensive chemicals.

Suppose, let's say, you want to know whether the hydrogen peroxide in your medicine cabinet has lost its strength. Just add a drop or



This is the proper way to heat liquids in a test tube. The alcohol lamp was made out of an empty paste jar

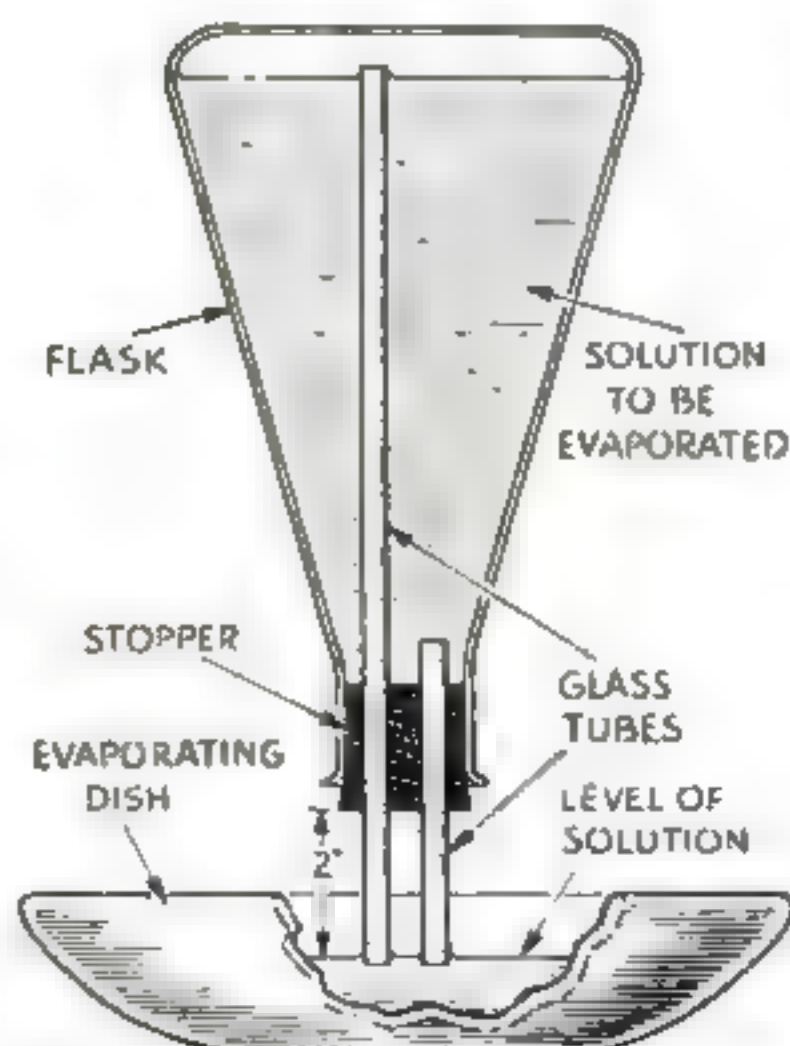
## You Can Make This Handy Automatic Evaporator



Here it is in use with an electric heater

**H**ERE is an example of a piece of laboratory apparatus easily made by the young chemist. It is an automatic evaporator. The solution to be concentrated is placed in the flask, which is equipped with a two-hole cork stopper.

How the evaporator is constructed. It feeds the liquid into the dish



A glass tube passes through one hole, just entering the flask and projecting two inches on the outside. A longer glass tube projects to the bottom of the flask and also extends two inches on the outside. The whole device is inverted over an evaporating dish or beaker, which is then heated. The liquid automatically flows from the flask and is concentrated in the dish or beaker, where it is kept always at the same level.



two of hydrochloric acid to a sample of it in a test tube, then several drops of potassium dichromate solution, and heat the contents of the tube. If a blue or green color appears, the peroxide is still good.

By equally simple experiments, the presence or absence of many substances in an unknown compound may be confirmed. Moisten baking powder with water, wait until the bubbling stops, and add a drop or two of a solution made by mixing ten drops of tincture of iodine with six teaspoonfuls of water. If a blue coloration is formed, the baking powder contains starch. Carbonates, like marble or washing soda, effervesce when you add an acid. Ammonium compounds, such as sal ammoniac, can be recognized by the odor of ammonia when you heat them with an alkali.

Apparatus for more complicated experiments need not necessarily be purchased ready-made. You will be surprised to find the variety of equipment that you can put together from odds and ends.

An empty paste jar makes a fine alcohol lamp, when you solder a metal tube to the screw top and pass a round cotton wick through it. Transformed as shown in one of the illustrations, a half-dollar electric stove becomes a highly serviceable laboratory heater. A bent metal clamp, drilled with two holes, attaches an iron rod or laboratory support to the base. The same illustration shows a tricky way of using this heater in evaporating a large quantity of a solution, with an inverted flask arranged to give an automatic feed.

A piece of wire with loops twisted in its ends will hold a test tube, for heating its contents over a flame. Always apply the heat near the surface of the liquid in the tube, which should be held nearly horizontal and with the mouth pointing away from you. This will prevent cracked test tubes, and keep any liquid that spatters from striking you or your clothing.

Bore holes in one of a pair of thin boards, mount them one above the other in a wooden stand with the bored one uppermost, and you will have a serviceable rack for your test tubes. Small bottle brushes, from the five-and-ten-cent store, will help clean them after use.



The siphon jug is handy if you don't have running water in your laboratory. Just pinch the clamp and water runs out of the tube

If you have never tried cutting and bending glass tubing, you will be surprised to find how easy it is to make pieces to order for connecting your apparatus. Nick one side crosswise with the edge of a three-cornered file, press with your thumbs on the opposite side of the tubing while you hold it in your hands, and it will break cleanly in two. Twirl the cut end in a flame and it will be smoothed or "fire-polished." To bend glass tubing, roll it in the flame until it is softened, and it will then take any desired form. A wide flame will avoid a flattened, constricted bend; use a flame spreader with your Bunsen burner, or make three miniature alcohol lamps from medicine vials, by fitting the corks with metal or glass tubes and wicks, and mount them side by side in a wooden block. To form a small nozzle from tubing, heat it glowing hot and draw it out like taffy as you remove it from the flame, cutting off the tip at the *(Continued on page 234)*





## Swinging Weight Illustrates How Light Is Polarized

SUPPORT a pencil, as shown, so that it cannot move vertically. Leave enough slack in the side strings, however, for the pencil to pivot about an inch to either side. Hang a small weight from its end. Release the weight over A, in the picture, and it will swing freely between A and B. But start the weight from C or D, and so much energy is expended in moving the pencil from side to side that the swinging quickly stops. If you swing the weight in a circle, its sideward motion is soon "damped out" and it swings only between A and B. The experiment shows mechanically what happens when light is polarized, or restricted to vibration in a single plane.

## A Vacuum in a Can of Paint

NEXT time you remove the cover from a can of paint, listen carefully and you will notice a sucking noise. The oil in the paint has chemically combined with the oxygen from the air within the container, leaving a partial vacuum inside the can. The sound of outside air rushing in to take the place of this partial vacuum is what you hear when you open the can.

# Easy Tests

## Spinning Can Gauges Viscosity of Liquid

PLACE equal weights of water and of sand in two similar cans, suspended from thin wires. Twist the cans the same number of times and release both. The sand-filled can, turning as a unit, oscillates back and forth for several minutes. The other soon comes to rest because its energy is absorbed by internal friction or viscosity. A more viscous liquid like molasses will cause the can to oscillate longer.



Rotated by a twisted wire, the can containing sand keeps on oscillating after the one holding the same weight of water has stopped





# Prove Scientific Laws

## Test Shows What Makes Soil Dark and Rich

PUT a little rich, dark soil in each of two can covers, and balance them exactly upon a pair of scales, by adding to or withdrawing from the contents of either. Remove one cover from the scales and heat the soil just enough to drive off all the moisture that it contains. You will find that its color has been lightened; and reweighing it, against the unheated sample, will show that it has also lost weight. Now keep it at red heat for several minutes. On cooling, it will prove still lighter in color and weight. Darkness and richness in soil are largely due to humus, or decayed vegetable matter. When you heated the contents



Heating removes moisture and humus, making soil lighter in color and weight

of the lid red-hot, you burned the humus. This, combined with oxygen, was released from the soil in the form of smoke and gases, while the soil returned to its light, barren state.

## Seeing "Kick" from Watch's Tick

PLACE a watch, with a small mirror propped against it, on a cardboard carton top hung by threads. Concentrate a beam of lamplight, with a reading glass and a small hole in paper, so that the mirror will reflect it to a distant wall. Every action has its reaction, and even the motion of the watch's tiny balance wheel produces an observable "kick" or recoil, as shown by the oscillation of the reflected spot of light as it dances on the distant wall.



## Surface Tension Lifts Soap Film

DIP a glass funnel in soap-suds and lift it out, as above, while your finger closes the stem. A soap film clings across the mouth. Remove your finger and the film will crawl upward into the stem, drawn by surface tension to the smallest possible area.



Reflected light shows recoil from movement of watch's balance wheel



# Everyday Jobs for



Examining the edge of a chisel by holding it against the bottom of a microscope stage removed from its base. Inset, a razor-blade edge



flexible in every direction."

So I dragged out a microscope and set it for about fifteen diameters magnification. But I found that that was not enough, so I switched to 100. It didn't take long to prove that my visitor had guessed right, and that the chain was built almost exactly like those on bicycles. Solid links, flat and oblong, with a hole at each end, alternated with links made of two thinner pieces of the same general shape. Tiny rivets held the links together.

The workmanship on that tiny chain was amazingly good. The links were uniform in size and shape, and the microscope

**T**HE other day, a friend dropped in to see whether I could help him settle a little argument. He fished around in his pocket until he found a small envelope, and then asked me for a sheet of white paper. Opening the envelope, he inverted it carefully over the paper, and something that looked like a tiny, crooked piece of wire fell out.

"It's a chain," he said. "One of the fellows at the shop gave it to me, and said it's from a watch about 150 years old. It was part of the watch works, he claims."

"What do you want me to do with it?"

"Take a picture of it, if you can. Nobody at the shop can figure out how it's made; it's so small we can't see the links. But I've an idea it's like a bicycle chain, because it isn't

showed no sign of undue looseness or tightness of rivets. Yet, if the chain owner was right, the work had been done when precision tools as we know them—including microscopes—were scarce indeed.

We got out a micrometer and measured the chain. It was 0.0075" thick and 0.019" wide. If these figures do not mean much to you, compare them with the pages of this magazine, which measures 0.003". In other words, the chain was the same thickness as two and a half of these pages.

This little incident serves to illustrate how useful a microscope can be at times, in addition to its usual job of revealing the countless wonders of nature. It suggests, also, other everyday jobs a microscope can per-



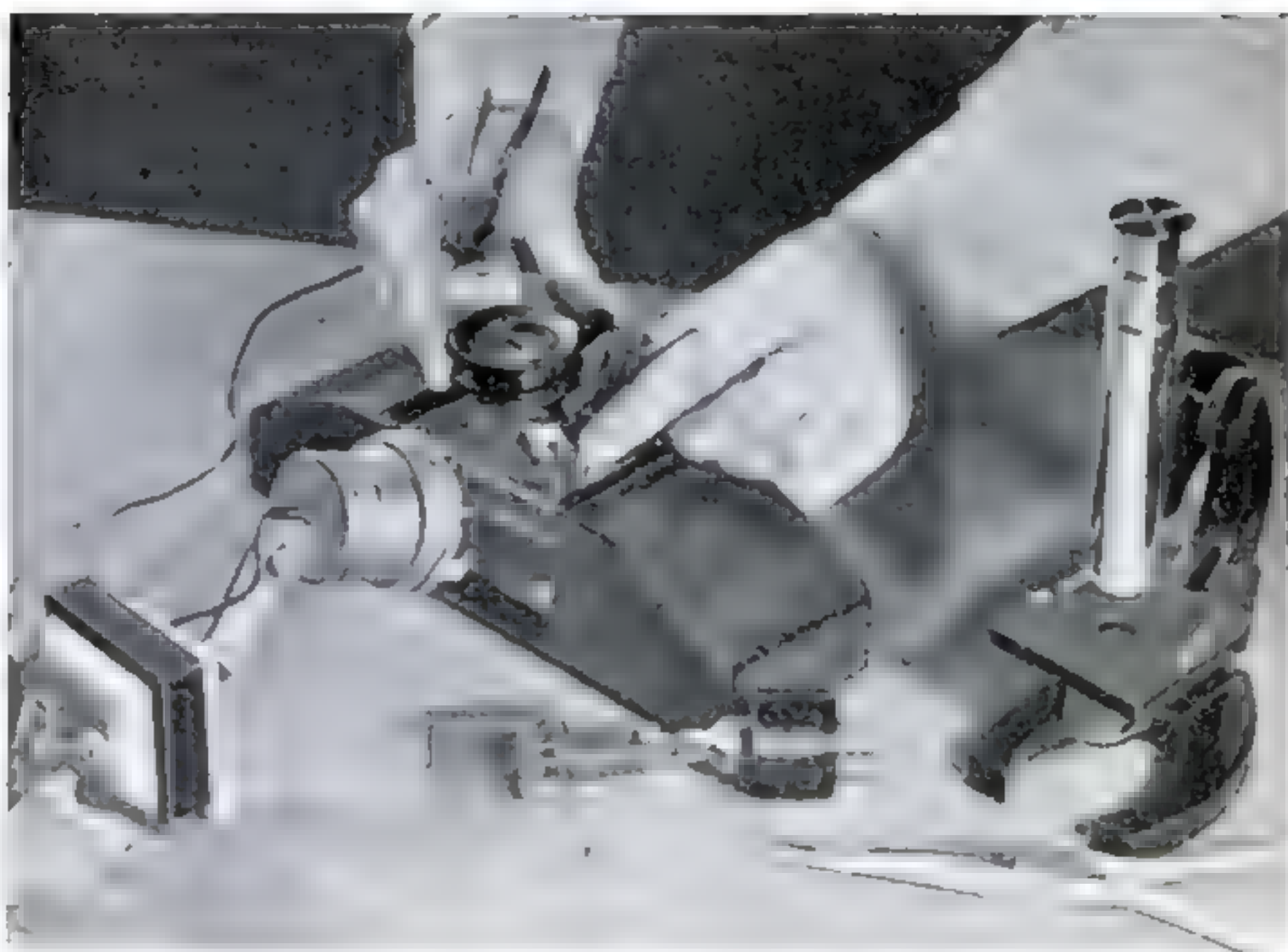
# Your Microscope

form and thus help earn its keep.

Maybe you are a model builder, or do something else that involves the use of very small parts. Tiny bolts or screws, perhaps, or minute gear wheels, are among the things you must make and handle. If so, a microscope would be a necessity to you. With it you can examine the tiny parts and see whether they are sound, and of correct size and shape.

It is a bit difficult to judge shape and size without making measurements of some kind. With a laboratory-type microscope, measurements of depth can be made with the graduated fine-adjustment screw, and measurements of width or lateral distance can be made with a micrometer eyepiece, which has to be calibrated with the aid of a stage micrometer. A calibrated mechanical stage can be used for measuring fairly large objects: use a cross-hair eyepiece for centering the image.

But there is another way that probably will

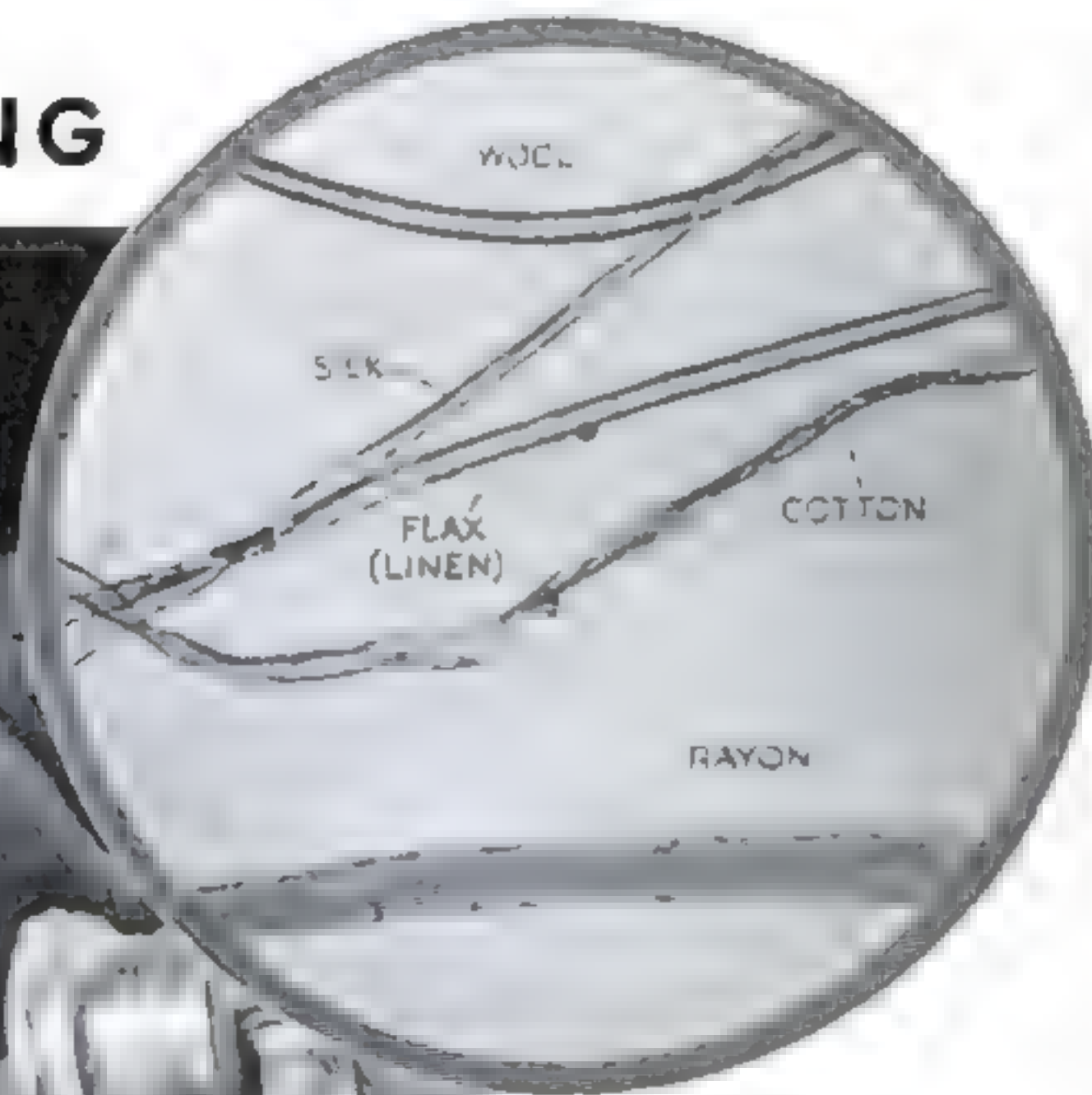
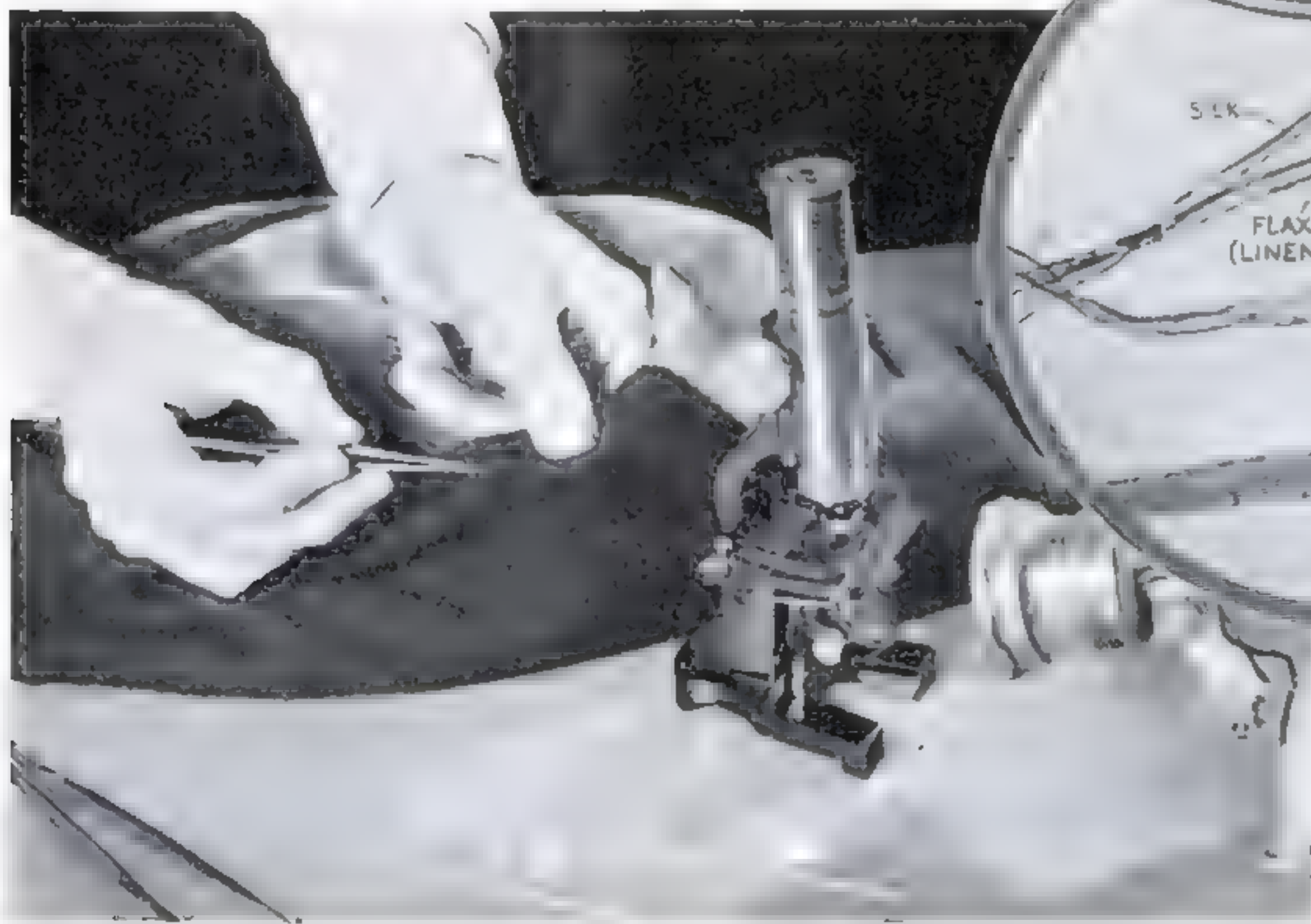


Construction of radio tubes can be studied with your magic lenses. A dissecting microscope is being used here to examine old tube parts

work just as well or better. Usually you make a drawing, considerably larger than the finished piece is to be, of the tiny parts required. With your microscope, you can compare the finished work directly with the drawing, and check the size and shape.

There are two ways of doing this. One is

By **MORTON C. WALLING**



What kind of material is in that new suit? Your instrument will tell you. The photomicrograph shows how various fibers appear



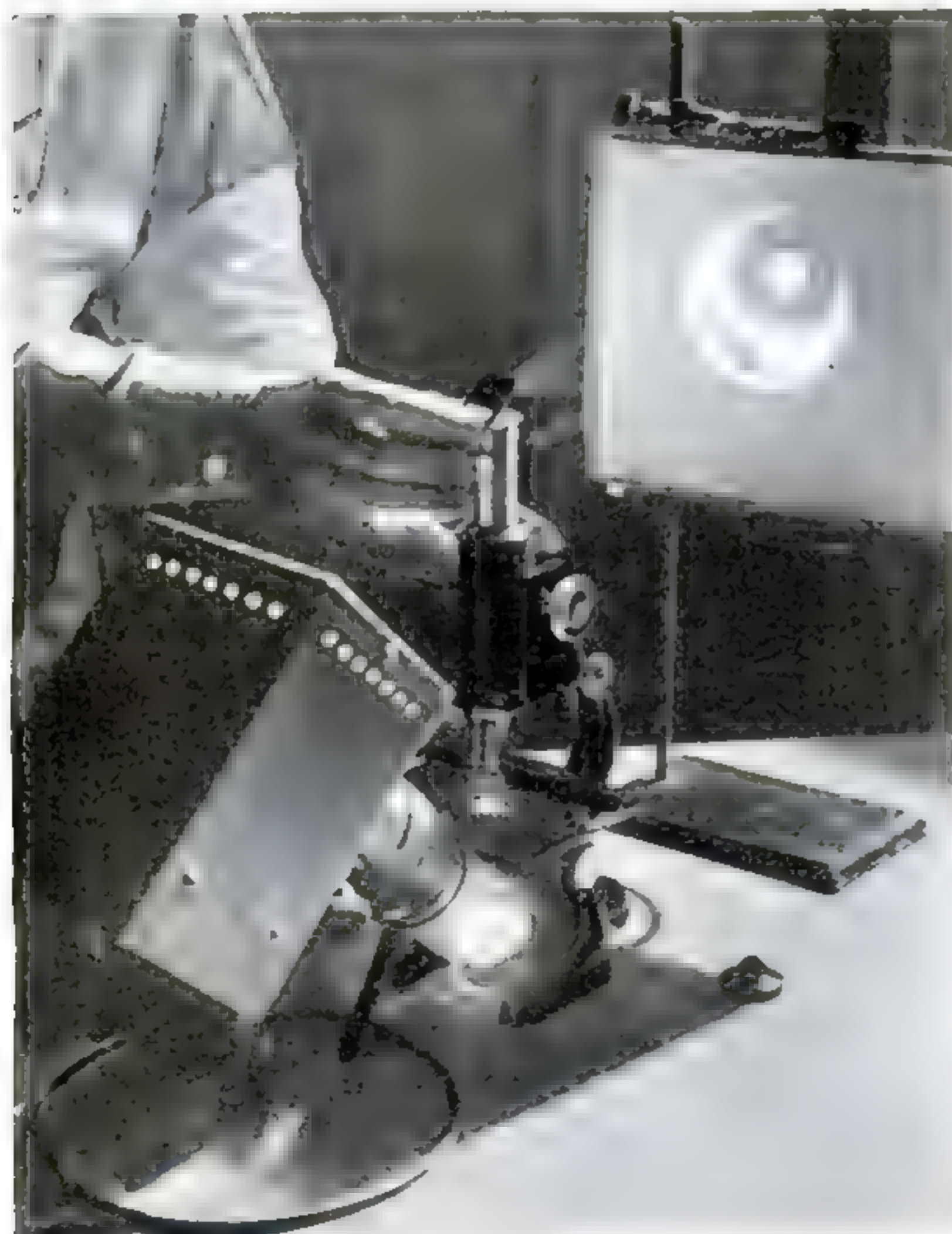


Giving rotary-file teeth a scientific third degree. In this case, the illuminator is a small projector made for use with camera-film slides

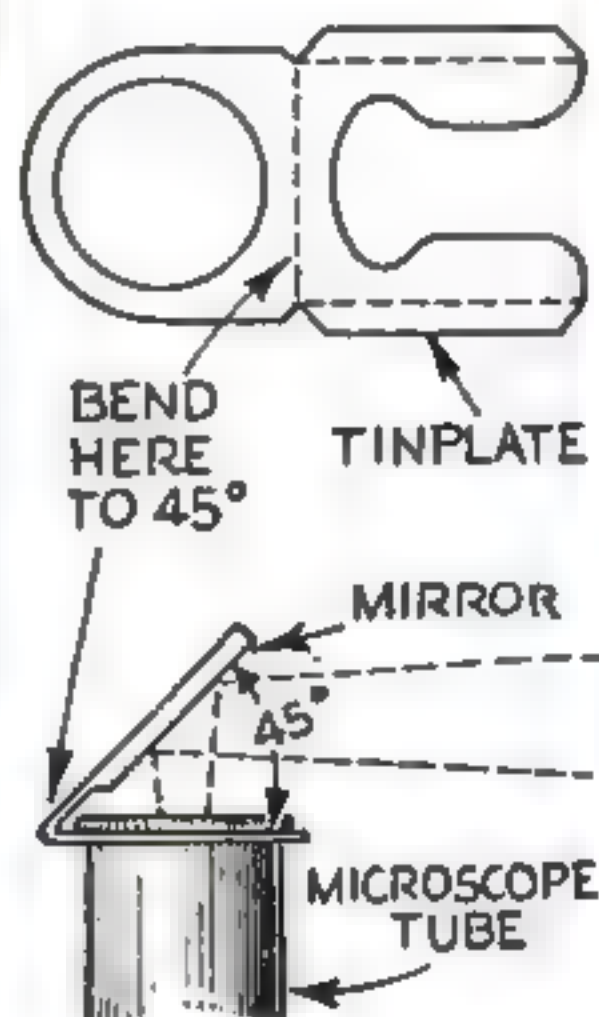
to rig up a microprojector (P.S.M., Sept. '37, p. 76), and with it project the silhouette image of the machine part directly on the drawing; or, if no drawing is involved, on a sheet of white paper. Then you can judge the shape and size, and make direct comparisons of different parts of the piece by measuring

cation of fifteen to thirty diameters. Rack the tube up as far as it will go, or if that cannot be done, hold the lens to be examined beneath the microscope stage hole. Transmitted light is used, although outer surface dirt and defects can be seen by reflected light. In this way you can inspect both inner and outer lens elements minutely.

In a similar manner you often can tell whether that "diamond" ring is the real thing or just paste. Not long ago I saw something that sparkled lying on the pavement. I picked it up, and wondered if I had a diamond, for the stone was brilliant and clear, and was cut like one. When I got a chance, I put it



A piece of mirror glass held in a tin clip, as below and at right, converts your microscope into a microprojector



the projected image with a ruler.

The second way is to use a camera, such as a 5" by 7" view camera, attached to the microscope so that the image is formed on the ground glass. Then you can measure the image or compare it with a drawing on tracing paper or other transparent or translucent material.

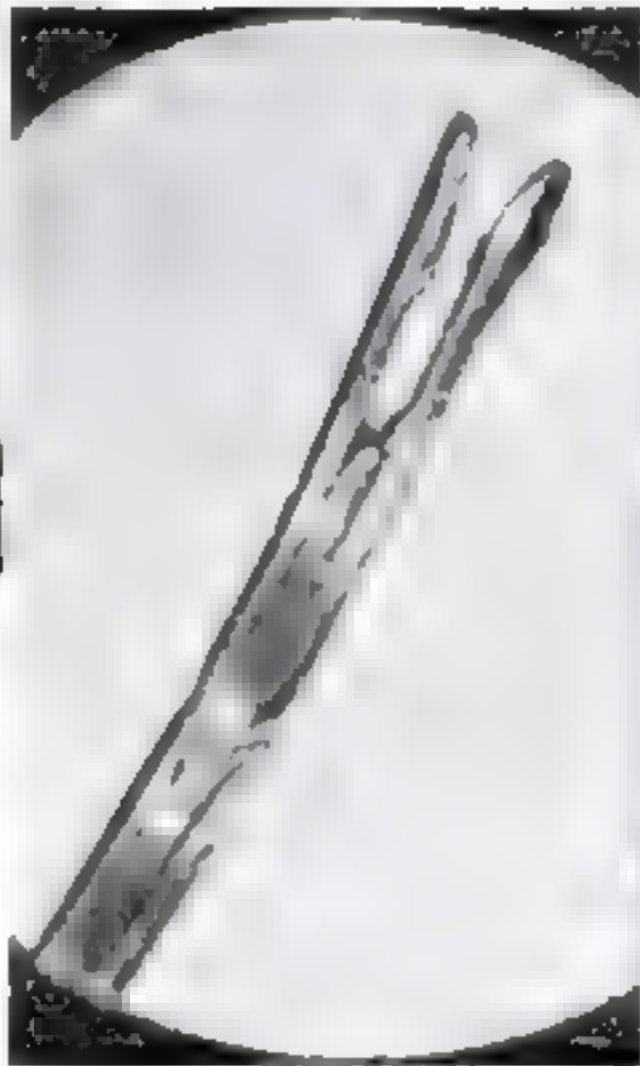
These methods of examining screw threads, gear teeth, and other shapes are exactly like those used in industrial laboratories to keep tab on production.

I often use one microscope lens to examine another for dirt and scratches. Photographic lenses can be checked in the same way. On the microscope, use an objective and eyepiece that give a magnifi-





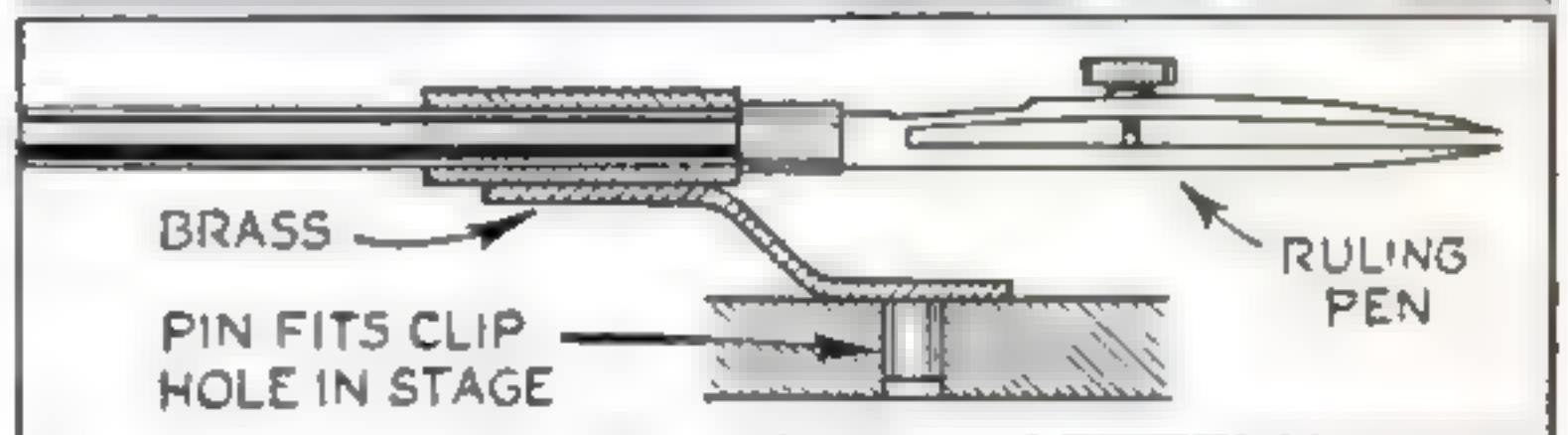
Two microscopic views of a tiny bicycle-type chain removed from a very old watch



under the microscope, and discovered that some of the facets had badly chipped edges. Now, a real diamond is not very easily chipped or scratched, being about the hardest thing known, so I began to be doubtful of my find. A later visit to a jeweler confirmed my suspicions: the jewel was a white sapphire. To examine jewels, simply lay them on a blank slide on the stage if they are loose, or hold the ring or other mounting so the stone will be in proper relation to the objective.

And if you have been wondering whether that suit you bought at a sale is real wool or not, your microscope will help you settle the question. First, get some material you are certain is wool, and examine its fibers. Then if all those in the suit look the same way—if they are long cylinders with scaly surfaces—you can be happy. In a similar way you can identify linen (flax), cotton, silk, and rayon. The microscope is a highly important instrument in the textile industry, and it can be equally serviceable in any home.

In one of the Government laboratories in Washington is a man who is an expert on animal fibers such as sheep wool. He has to slice the fibers into cross sections to examine them with a microscope, and he developed a clever tool for doing this with the aid of ordinary safety-razor blades. But he found that only one razor blade out of ever so many is sharp enough to cut microscope sections. So he checks each razor blade by looking at its edges with a microscope. He has gone through bushels of razor blades in this manner, picking out the rel-



For examination, the chain was held in a manipulator made from a draftsman's ruling pen, as in the drawing

atively few really sharp ones to do the work.

Maybe you won't find it worth while to examine your own razor blades in the same way, unless you use them for cutting microscope sections, but it may pay you to turn your microscope on some of your other edged tools. Examination of a plane bit, for in-

stance, requires but a few seconds, and will tell you more about its condition than any number of trial cuts. Not that a plane bit has to be microscopically uniform, but the nearer it comes to that state the better. And then there are chisels, knives, etching tools, engraving tools, carving implements, and a host of other edged tools that can be judged quickly and accurately with a microscope. Such examination can be made either with light fall-



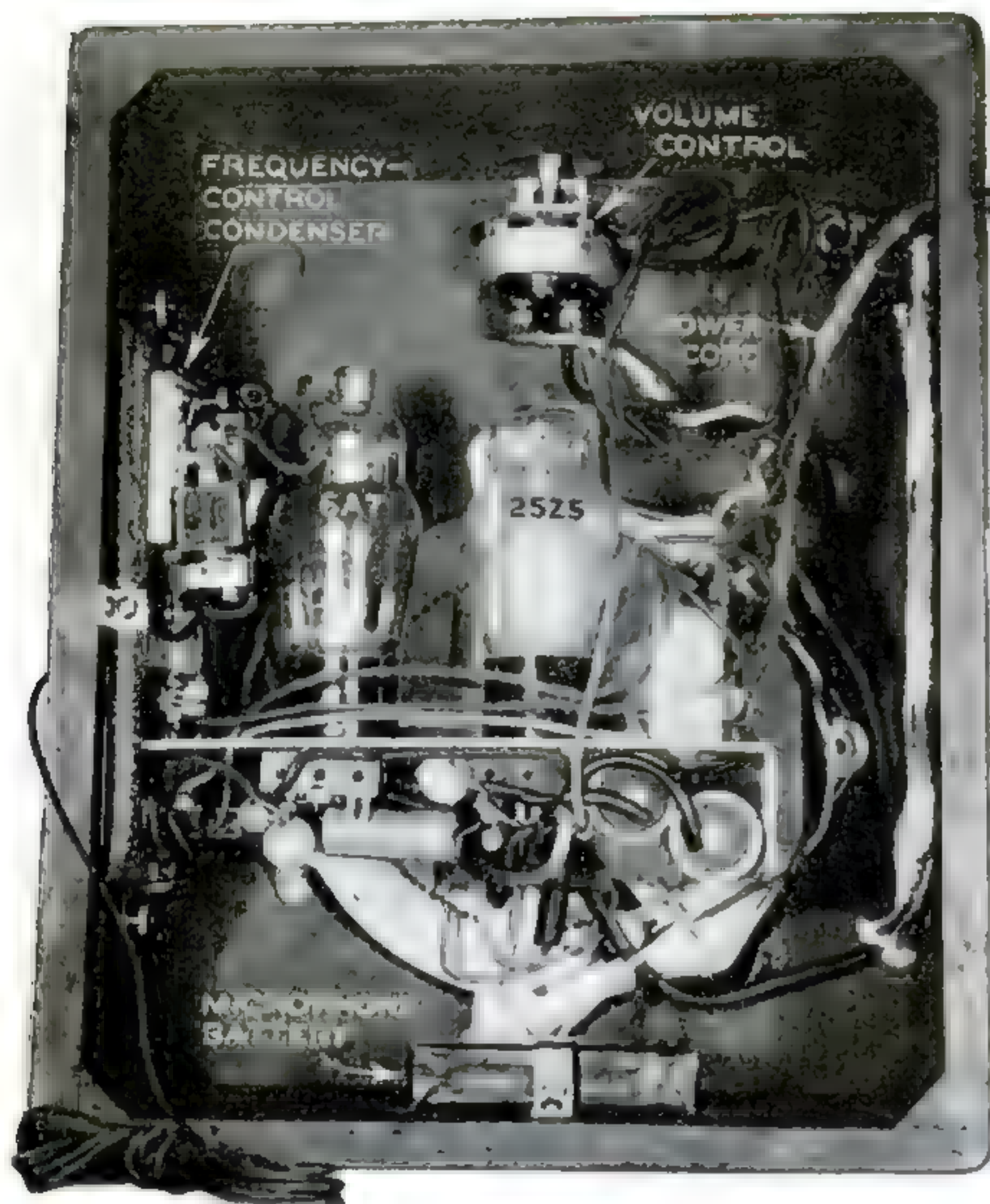
Part of a white sapphire. The chipped edges of facets prove it's no diamond

(Continued on page 236)



# "Wireless" Radio Phonograph

REQUIRES NO CONNECTION TO SET



**N**EXPENSIVE and easy to build, this "wireless" record player may be used with any alternating-current radio receiver without making any actual connections to the receiver circuit. In addition, when you plug in a microphone and flip a switch, the record player becomes a public-address system that will allow you to do your own program announcing through the radio's loudspeaker. In use, the device is simply plugged into a convenient electric outlet.

Essentially, the "wireless" feature of the pick-up consists of a tiny radio transmitter (oscillator) tuned to a frequency around 550 kilocycles, or to any unused band at the upper end of your radio's tuning dial. The power of the little transmitter is, of course, very low, and the distance it may be placed from your receiver depends upon the radio's sensitivity. With a good superheterodyne, the phonograph can be used in an adjacent room. With less powerful receivers, it may be necessary to wrap the insulated antenna of the phonograph-transmitter loosely around the receiver's antenna lead-in, without making an electrical contact.

If the reader already has a synchronous electric turntable, and either a magnetic or crystal pick-up, he may use these with the wireless oscillator and avoid the expense of buying new ones.

The oscillator circuit is built on a compact aluminum chassis measuring  $1\frac{1}{4}$ " by  $2\frac{1}{2}$ " by  $6\frac{1}{2}$ ". A black crackle panel serves as the mounting for the trimmer condenser that adjusts the tiny 550 - kilocycle radio - frequency transformer, the microphone jack, and the switch for changing from pick-up to microphone.

The two tubes used are a 25Z5, as a rectifier, and a 6A7, as a combined modulator and oscillator. Two 6,000-ohm, one-watt



Study the wiring diagram carefully. The set is actually a two-tube transmitter. Parts are best arranged as in the photo above





Plugged into an outlet anywhere in the room with your radio, the unit "broadcasts" records through the loudspeaker

By  
**FRANK TOBIN**

•

Volume is controlled by a knob mounted near the pick-up arm. The antenna, seen leading out of the cabinet, is stretched on the floor during operation



By flipping a switch and plugging in the microphone, you've got your own public-address system for entertaining friends. How the synchronous motor for the turntable is installed may be seen at the left



resistors, and two 16-mfd. electrolytic condensers are used for filtering the rectified current from the 25Z5.

To obtain the best results with the carbon-

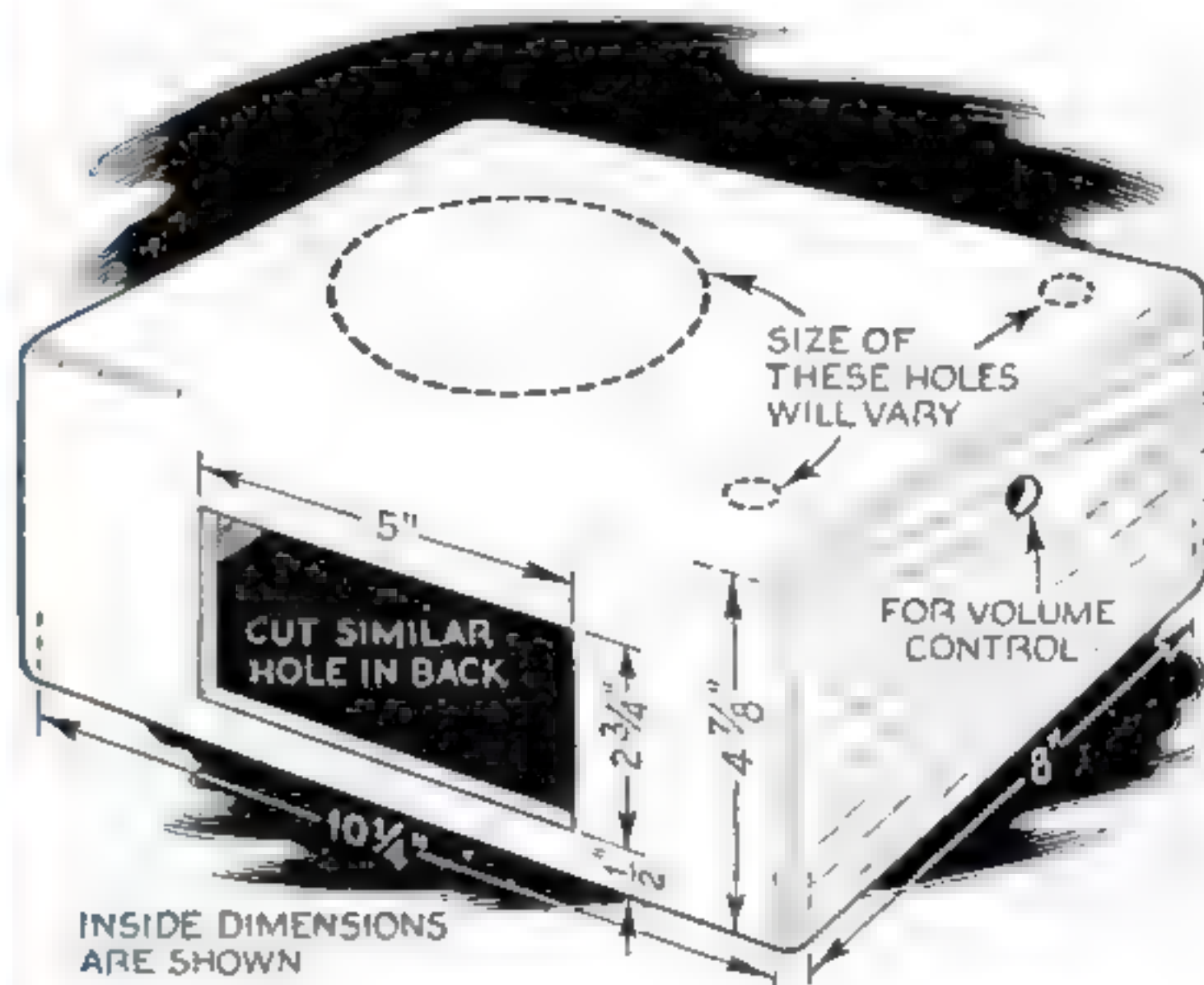
type microphone recommended, a suitable transformer with a 200-ohm primary is used in conjunction with a  $4\frac{1}{2}$ -volt "C" battery. As shown, the battery fits snugly inside the cabinet.

Care must be taken to follow the exact values of the fixed condensers and resistors specified in the wiring diagram, and under no circumstances ground any of the wiring to the chassis or panel. This is to prevent any possibility of shock should the user accidentally touch the chassis of the receiver while holding the pickup. Standard A.C.-D.C. antenna wire can be used for the aerial of the transmitter, which may be approximately twenty-five feet long. When making the wooden cabinet shown below, be sure and cut a ventilator opening in the back.

## LIST OF PARTS NEEDED

Rectifier tube, 25Z5.  
Oscillator-modulator tube, 6A7.  
Synchronous motor (2" deep).  
Magnetic or crystal pick-up.  
Radio-frequency transformer, 560 Kc. (special)  
Microphone transformer (midget).  
Hand microphone (carbon-type).  
Toggle switch.  
Midget wafer socket, six-prong.  
Midget wafer socket, seven-prong.  
Two electrolytic condensers, 16 mfd., 175 volt.  
Two tubular condensers, .05 mfd.  
Tubular condenser, .1 mfd.  
Trimmer condenser, 350 mmfd.  
Mica condenser, .00001 mfd.  
Mica condenser, .00004 mfd.  
Mica condenser, .002 mfd.  
Two resistors, 6,000 ohm, 1 watt.  
Resistor, 1,500 ohm, 1 watt.  
Resistor, 10,000 ohm,  $\frac{1}{2}$  watt.  
Line-cord resistor, 290 ohm.  
Volume control and switch, 500,000 ohm.

*Miscellaneous:*—Aluminum chassis, crackle panel, microphone jack and plug, A.C.-D.C. antenna, cabinet, etc.



Details of the inexpensive wooden cabinet. No bottom is needed, but rubber feet should be used



# "Push-Button" Receiver

## FOR BEGINNERS

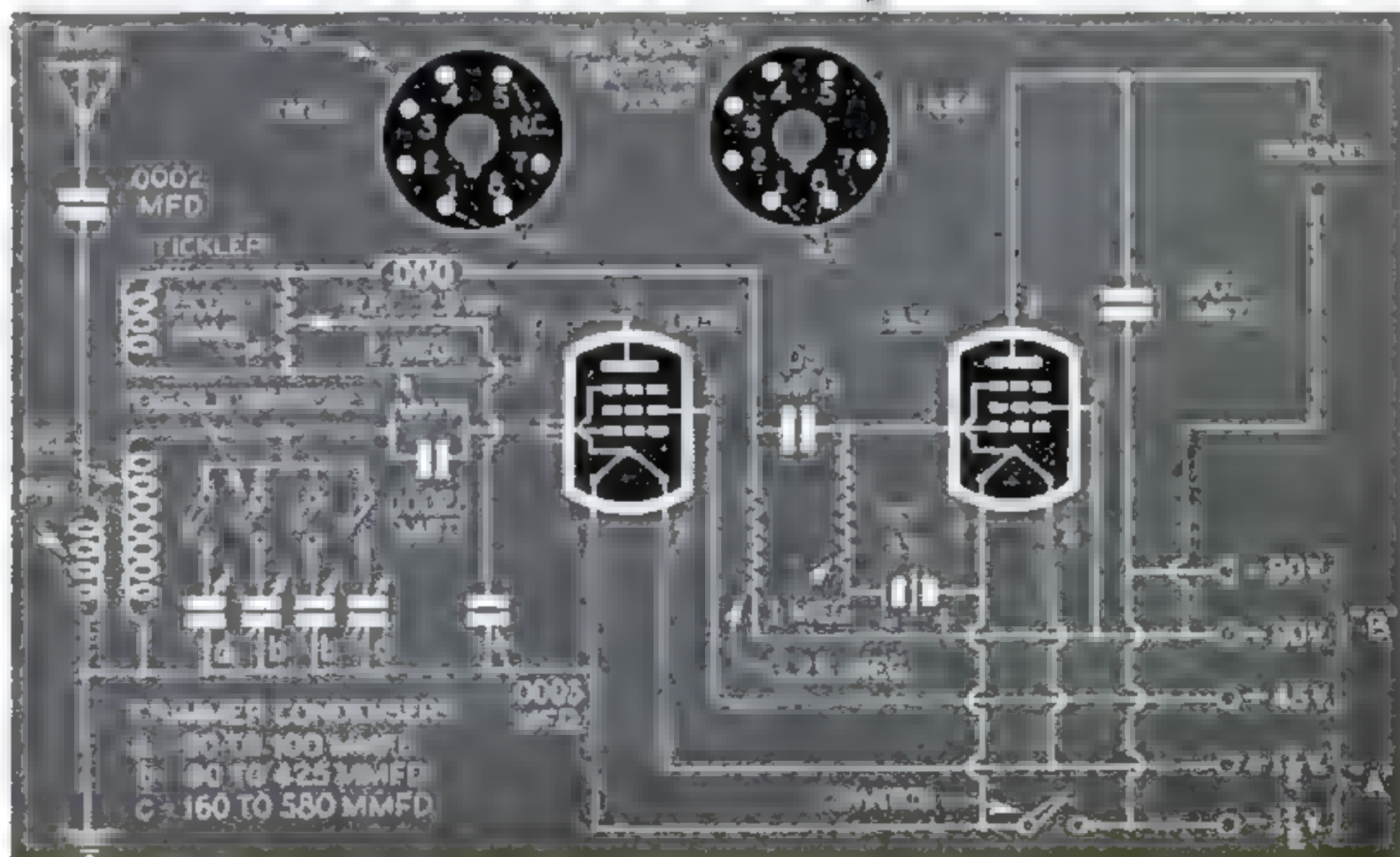
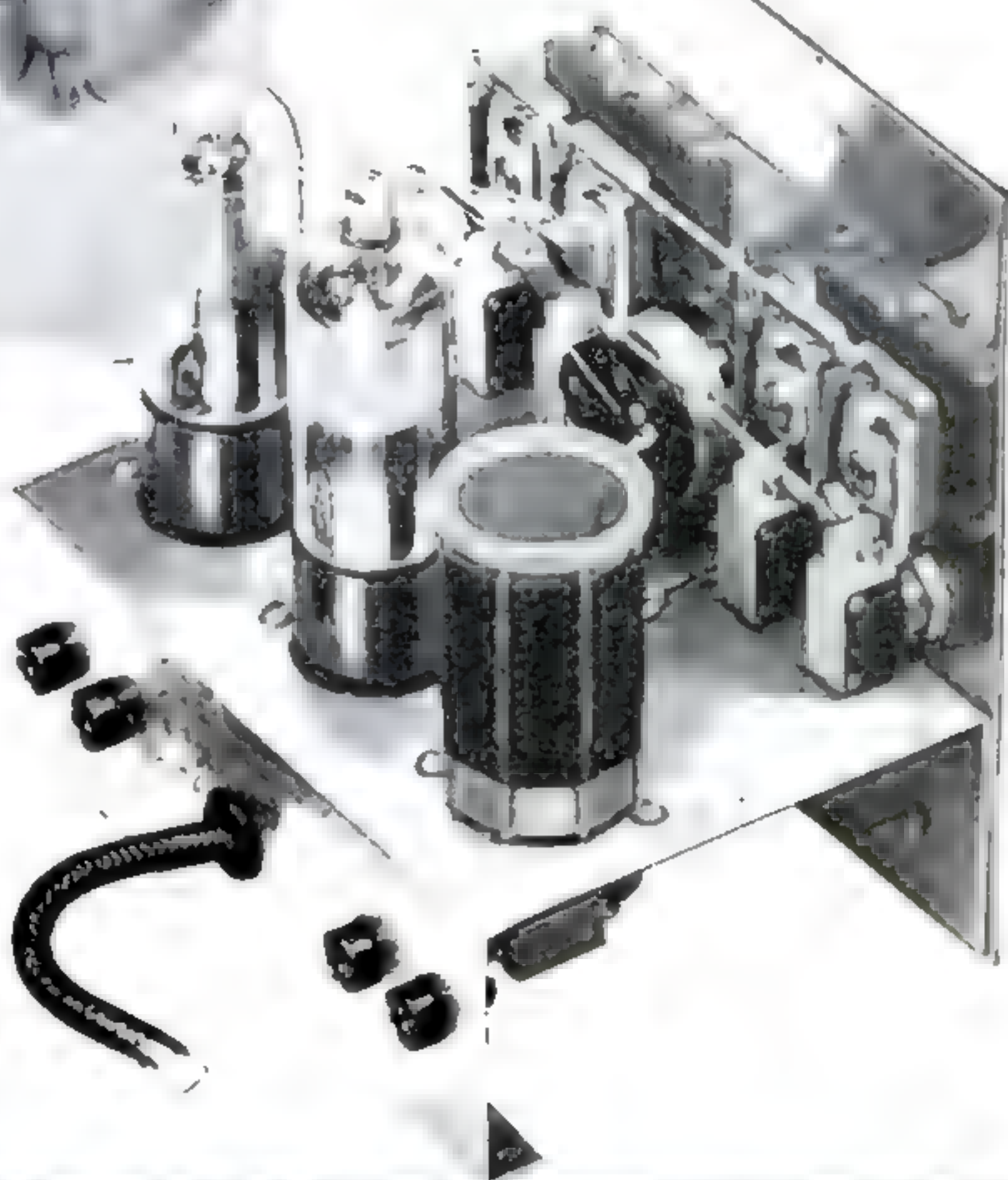


Once tuned with a screw driver, the push-button receiver instantly gets any one of four stations

**T**UNED by a push-button system that beginners can build with ease, the compact, two-tube battery set described here quickly selects any one of four stations. The simple tuning mechanism consists of four toggle switches and four trimmer condensers of varying capacities, mounted in parallel across the secondary winding of a six-prong coil. The  $1\frac{1}{2}$ -volt tubes need only one dry cell for the "A" supply. A 25,000-ohm variable resistor controls regeneration, and the resistance-coupling between the two stages provides sufficient volume for either earphones or a small magnetic speaker.

To adjust the push-button circuits, switch in one of the four trimmer condensers and tune in a station with a screw driver. Open the circuit with the switch, and adjust the next circuit, and so on.

A 45-volt "B" supply is sufficient for head-phone reception. For a small speaker, or to increase set sensitivity, a 90-volt "B" supply should be used. A "C" battery is needed only with speaker operation. When phones are used, ground the 1-megohm grid resistor to the chassis.



Note the parallel tuning circuits. All parts specifications are shown here



# NEW HELPS FOR

## Portable Two-Way Radio Sends Signals 500 Miles

CAPABLE of two-way communication over a distance of 500 miles, a portable radio that straps comfortably on a man's back has just been completed by Thomas S. McCaleb, Harvard University radio instructor, for use on geographical exploration expeditions. The outfit with its built-in power supply weighs but fifty pounds—ten pounds less than a full Army pack—and has an output of over ten watts.



Though its range is 500 miles, this two-way radio is easy to carry. It is set up for use at right



## New Crystal Is Housed in Glass Tube

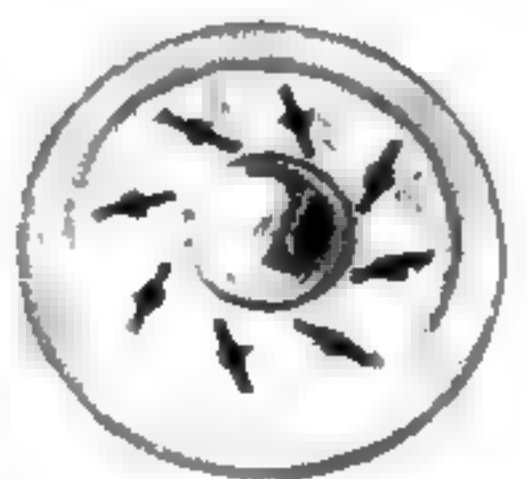
QUARTZ crystals for transmitter frequency control are now being inclosed in glass containers resembling radio tubes. As shown in the illustration at the right, the crystal is fixed to a mica strip placed between two metal supports. Contacts are brought out to metal prongs at the base of the tube, permitting speedy plugging in and changing of the units as required.



No dust can reach the quartz crystal inside the radio-tubelike unit

## Adapter Fits New Tubes

FOR experimenters using the new, all-glass, midget, self-locking tubes, a handy adapter unit has just been designed that allows the tubes to be plugged into the standard "octal" sockets. The top section of the adapter, shown in the upper of the illustrations at the right, has contacts to fit the tiny pins of the new tubes. Conventional prongs in the bottom of the adapter line up the tube connections and permit the tubes to be checked in standard tube testers. The adapter is available either in plain composition or in mica-filled, low-loss material.

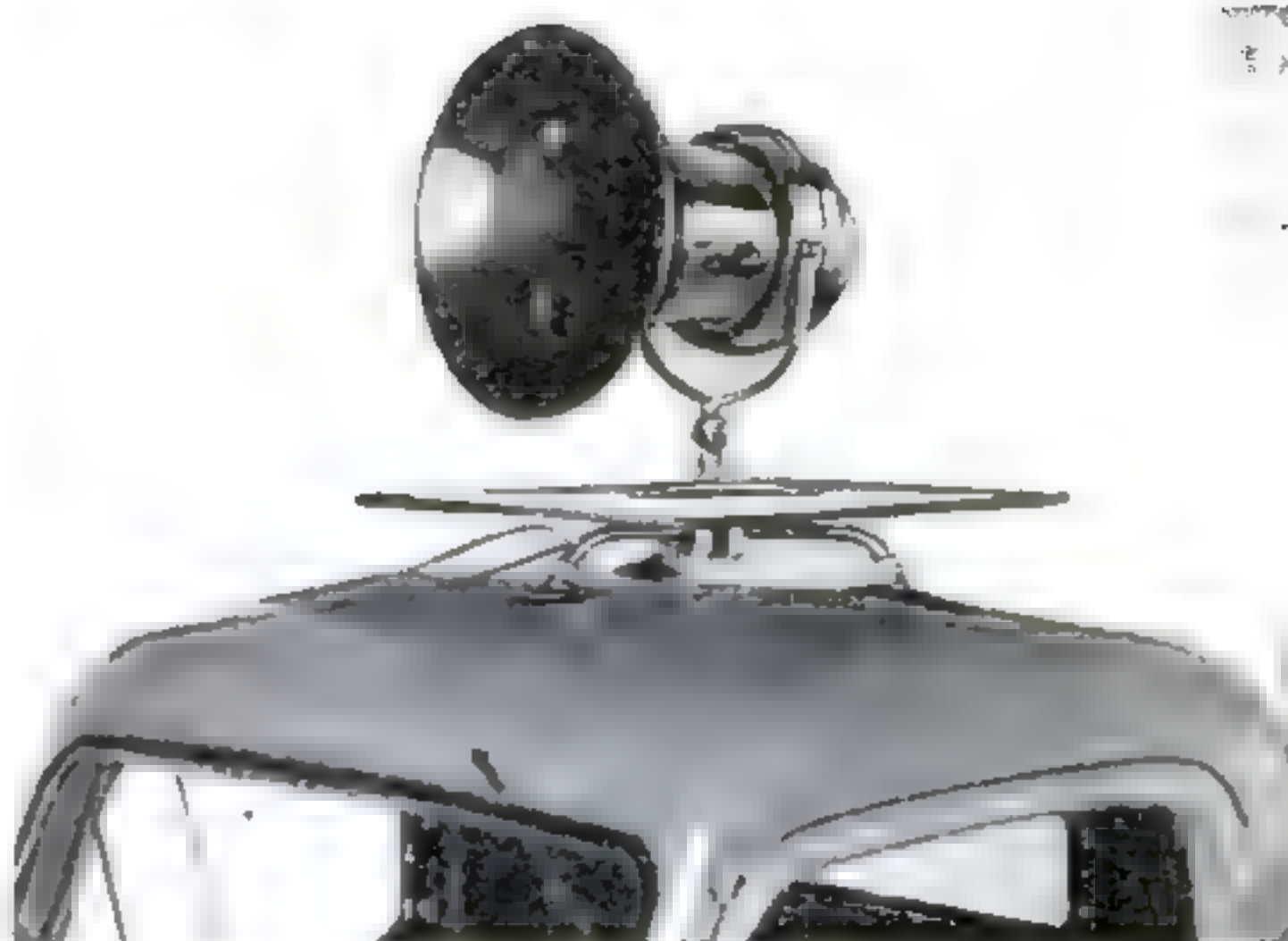




# RADIO BUILDERS

## Rubber Suction Feet Hold Speaker on Car Roof

A SPECIAL mounting fitted with rubber suction feet has just been introduced to permit a loudspeaker to be fastened to the roof of an automobile for police-emergency and other public-address uses. The suction-cup feet are attached to a metal tripod having a revolving head. A wooden board on which the speaker is fastened is connected to the head so that the speaker may be pointed in any direction without moving the automobile or dismantling the assembly.



The speaker is held fast to the car roof by suction

## Tap Switch Improves Transformer

CHANGING voltage connections on power transformers or matching speakers to the output of amplifiers is simplified with a new, eight-position switch that may be mounted on the top of a transformer's shield. The exact voltage tapped is shown by an indicator dial on the unit which is itself fully shielded. The compact device may be locked at any voltage.



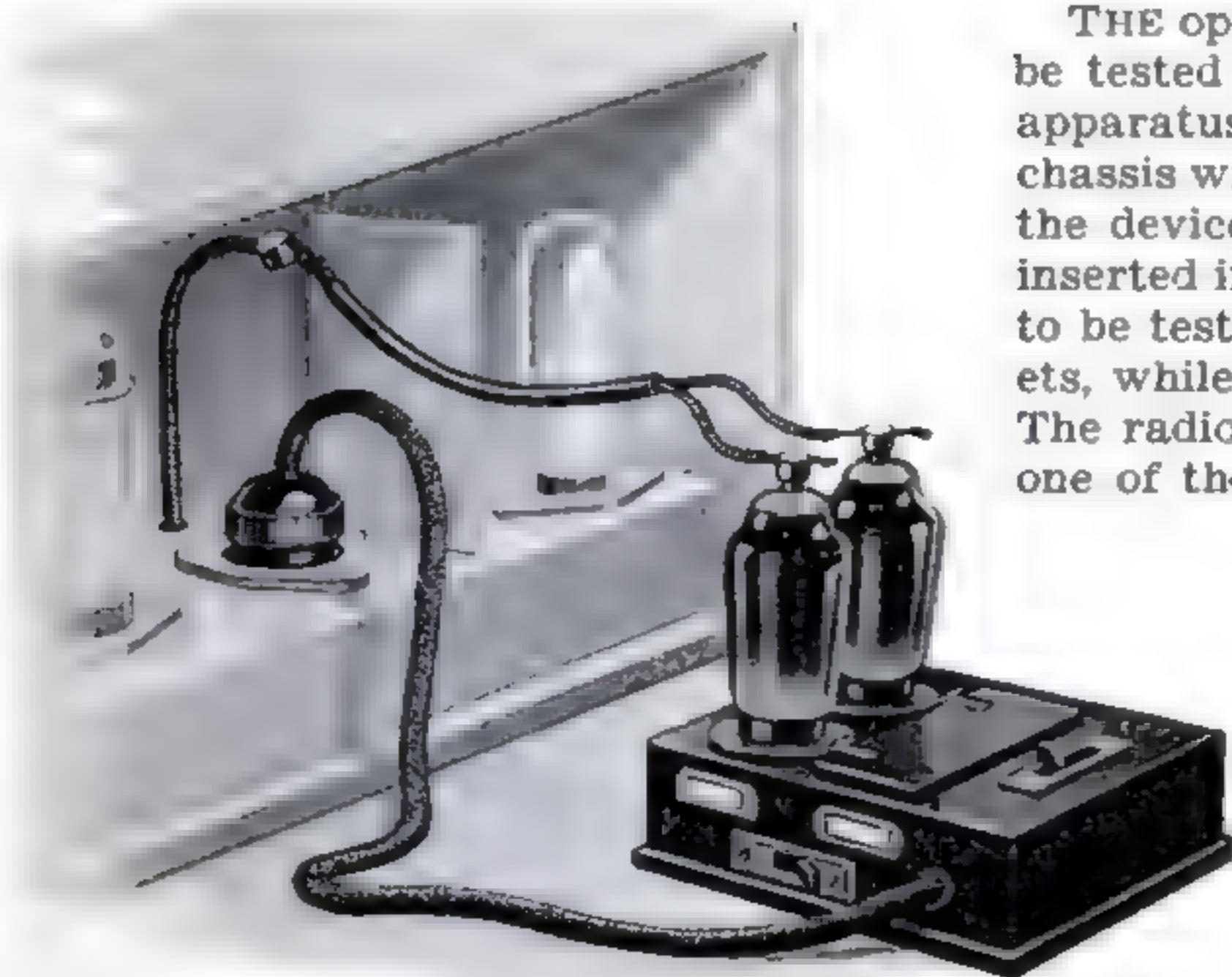
## Resistor-Choke Prevents Transmitter Troubles

COMBINING a noninductive, vitreous-enamelled resistor with a choke in one compact unit, the new suppressor shown below is designed to prevent the generation of the ultrahigh-frequency oscillations that often cause troublesome noises in push-pull transmitter circuits. Inserted in the grid lead at the tube socket, the suppressor introduces a negligible resistance, that does not in any way affect the power of the circuit.



## Tube Tester Gives Audible Comparison

THE operating quality of tubes in your radio may be tested by comparison with new tubes, with the apparatus illustrated at the left. Consisting of a chassis with two tube sockets and a pair of switches, the device is wired to a multi-prong plug which is inserted in the socket that ordinarily holds the tube to be tested. The tube is placed in one of the sockets, while a brand-new tube is placed in the other. The radio is then tuned to a station. By means of one of the switches, the old tube and the new one of known quality can be compared by trying first one, then the other. The second switch connects the tubes in parallel for additional checking. Connections to the tube grid caps are made with a pair of wires joined at one end by a single clip that fits securely on the caps. The device is mounted on a convenient base for carrying.





# New Ideas FOR Motorists

## Boards Clamped to Fenders Form Lumber Carrier

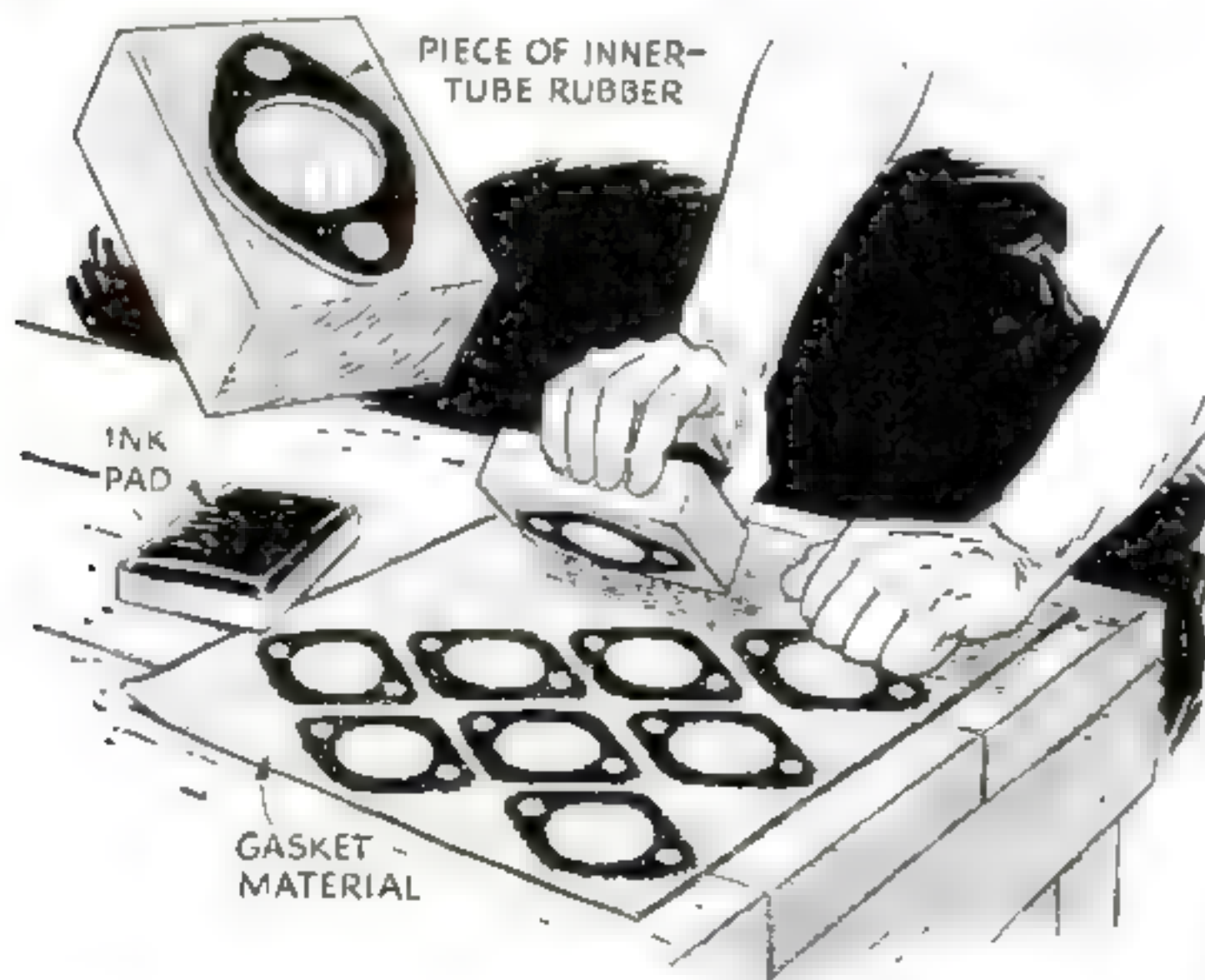


TO AVOID having to run ropes all over my car when I go to the lumber yard for supplies, I fasten narrow boards to the front and rear fenders on one side with C clamps, as shown. An old army blanket folded and placed on the top of the fenders protects the finish from being scratched by the boards during the hauling operations.—M. L. E.

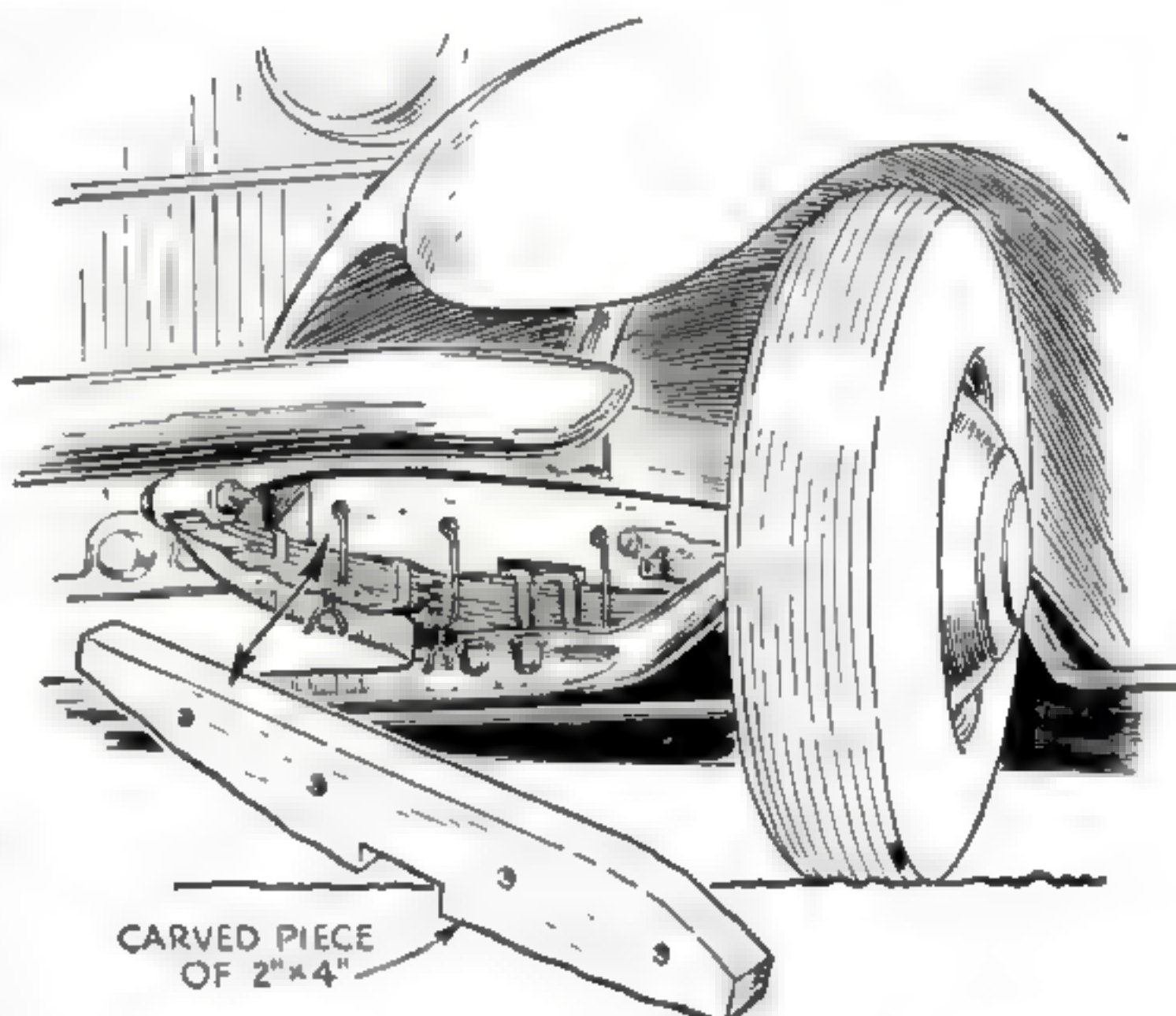
Held on by C clamps, the uprights make it easy to carry long boards

## Handy Gasket Duplicator Made from Inner Tube

WHEN you have to make a number of duplicate gaskets, you can save time by using the "rubber-stamp" method. Cut a pattern out of inner-tube rubber and cement it to a block of wood. Then by using an ink pad you can stamp as many impressions as you want on a sheet of gasket material. The gaskets corresponding to the original one can be cut out with shears.—E. L. B.



How gaskets are stamped in ink with the duplicator



## Temporary Spring Repair Gets Car to Garage

SOME time ago, I was driving in the country, miles from any garage, when a front spring broke clean through. Bad roads made it impossible to drive far without repairs of some kind. I got to a farm where I obtained a two-by-four and some wire. First I put the jack under the frame of the car on the side of the broken spring, and raised the side to its normal position. Then I cut the two-by-four with a hatchet to conform as closely as possible to the contour of the frame over the spring, and of the spring itself, as shown in the accompanying sketch. After wiring the two-by-four in place, I removed the jack. The splint got me all the way back home to a garage, where it was found the temporary repair had prevented any further damage from taking place.—W. E. M.



# NEW LOW PRICES ON KODAKS



New Eastman Plant, extensive addition to camera factory already the largest in the world, as it will appear when completed. Here will be produced the finest precision cameras, made by the largest group of American craftsmen ever assembled in the photographic industry.

Addition to the world's largest camera works, now building, means a substantial saving on your new camera—latest models included

EVERYWHERE you go, more and more people are carrying cameras. Picture making has grown beyond all experience, forcing camera production to the limit. Eastman is looking ahead, building an addition to the world's largest camera works, installing production facilities on a scale never known before.

YOU SAVE, BEGINNING RIGHT NOW. In a sweeping reduction, Kodak prices are now brought in line with these lower production costs to come. And that saving applies on the newest, most popular models which constitute the 1939 Kodak line.

What an opportunity to get ready for the new season—this time of World's Fairs—

this greatest of picture-taking years.

See your Kodak dealer now. He will show you brilliant, versatile, up-to-the-minute models that will increase your pride and skill in picture making—traditional Eastman quality at a saving that sounds almost too good to be true . . . Eastman Kodak Company, Rochester, N. Y.

## Going to the New York World's Fair?

Be sure to take your Kodak. Stop at the Kodak Building, where Eastman experts will advise you what to take and how to take it. And there you'll see the unique and gorgeous Cavalcade of Color—the GREATEST PHOTOGRAPHIC SHOW ON EARTH. Nothing like it has ever been seen before. Don't miss it.

## EXAMPLES OF THE PRICE REDUCTIONS

| KODAKS  | WAS    | NOW    | MINIATURES  | WAS    | NOW    |
|---|--------|--------|---|--------|--------|
| Kodak Junior Six-20, Series II, Single lens . . . . .           | \$8.75 | \$7.75 | Kodak Bantam, K.A. f.6.3 lens. . . . .  | \$9.50 | 50.50  |
| Kodak Junior Six-20, Series II, Bimat lens. . . . .             | 11.00  | 10.00  | Kodak Bantam, K.A. f.5.6 lens. . . . .  | 16.50  | 14.00  |
| Kodak Junior Six-16, Series II, Single lens. . . . .            | 10.25  | 9.25   | Kodak Bantam, K.A. Special f.4.5 lens. . . . .  | 27.50  | 22.50  |
| Kodak Junior Six-16, Series II, Bimat lens. . . . .             | 12.75  | 11.50  | Kodak 35, K.A. f.5.6 lens. . . . .  | 18.50  | 14.50  |
| Kodak Senior Six-20, K.A. f.7.7 lens. . . . .                   | 17.00  | 15.00  | Kodak 35, K.A. f.4.5 lens. . . . .  | 29.50  | 24.50  |
| Kodak Senior Six-20, f.6.3 lens, Diomatic shutter. . . . .      | 21.00  | 19.00  | Kodak 35, K.A. Special f.3.5 lens. . . . .  | 39.50  | 33.50  |
| Kodak Senior Six-20, K.A. f.4.5 lens. . . . .                   | 28.00  | 25.00  | Kodak Duo Six-20, Series II, K.A. f.3.5 lens (Compur-Rapid shutter). . . . .            | 57.50  | 52.50  |
| Kodak Senior Six-16, K.A. f.7.7 lens. . . . .                   | 19.50  | 17.50  | Kodak Retina II, Anastigmat f.2.0 lens, Compur-Rapid shutter (with field case). . . . . | 140.00 | 120.00 |
| Kodak Senior Six-16, K.A. f.6.3 lens, Diomatic shutter. . . . . | 24.50  | 22.50  | CINÉ-KODAKS   |        |        |
| Kodak Senior Six-16, K.A. f.4.5 lens. . . . .                   | 32.00  | 29.00  | Ciné-Kodak Eight, Model 20, f.3.5. . . . .  | 32.50  | 29.50  |
|   |        |        | Ciné-Kodak, Model K, f.1.9 (without case) . . . . .                                     | 88.50  | 80.00  |

Be sure to see your Kodak dealer about these remarkable price reductions.





## Straps "Lock" Car Doors To Keep Children Safe

CHILDREN riding alone in the back seat of a four-door sedan cannot open the rear doors while the car is in motion if the simple expedient illustrated above is used. Lower the door windows slightly and fasten a one-inch leather strap around the door frames and center post. The doors cannot be opened until the strap is unbuckled, and the danger of children tumbling out during a drive is eliminated.—C. W.

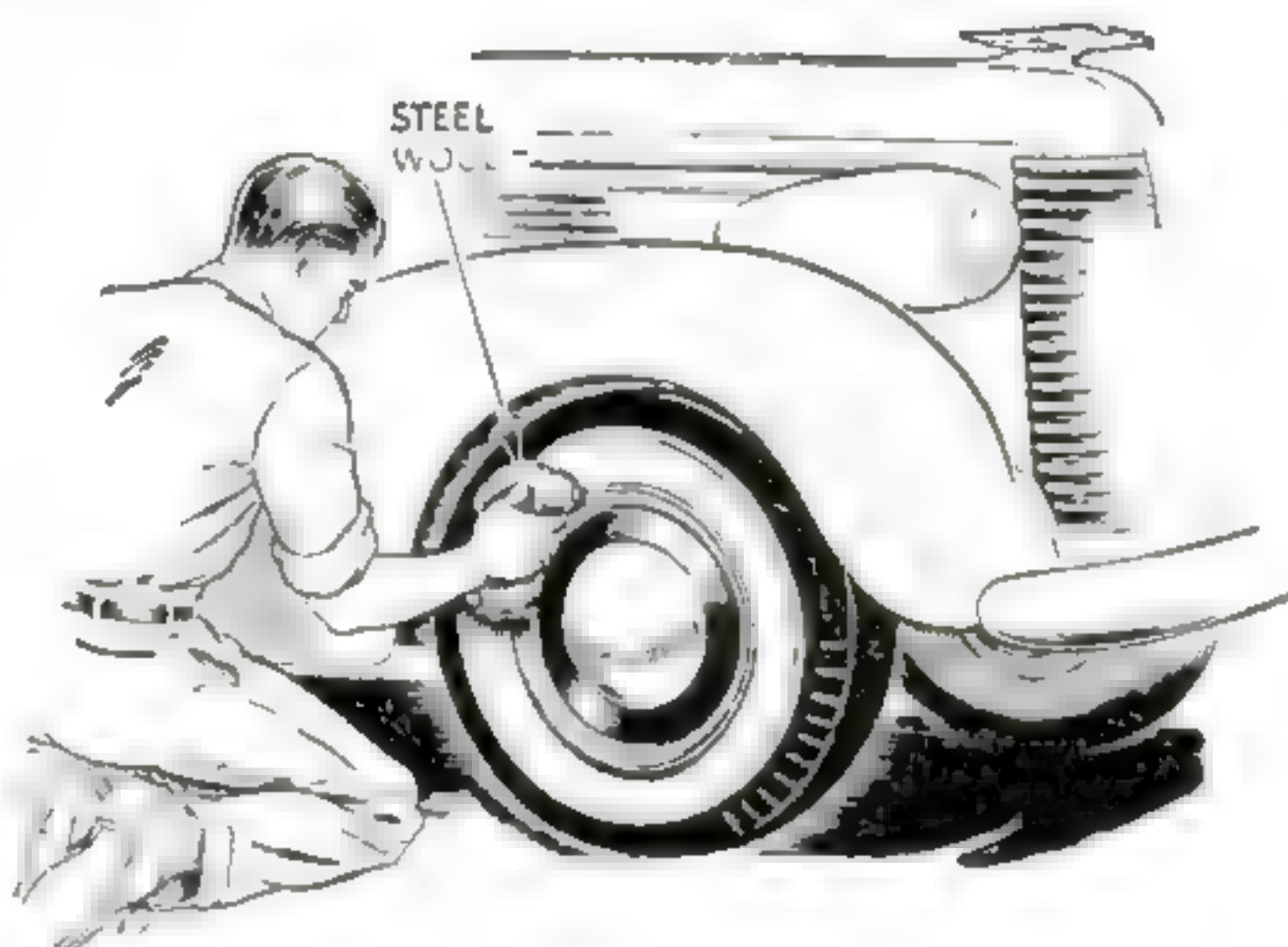
## Dust Serves as Polish for Chromium Plating



IN CLEANING my car, I've found that the fine dust that accumulates on the hood makes a fine polish for chromium plating. I simply brush the dust up into a pile with a soft cloth, pick it up with a damp cloth, and rub it over the headlights and other metal trim. A brisk rub with a polishing rag completes the job.—R. D. S.

## Steel Wool Cleans Spots from White-Wall Tires

THOSE white-wall tires have a way of defying your best efforts to get them perfectly clean, particularly after they have been on your car for a year or more. Small surface cracks that weather into the rubber become clogged with tar and grease from the pavement, and soap and water, while they clean the bulk of the grit from the walls, cannot do the job thoroughly. To restore the original whiteness to the tires, I've found a good rubbing with steel wool will do the trick. Besides getting the dirt from the tiny cracks, the wool will remove scuffs and scratches in the rubber. Naturally, the operation should not be repeated too often, as the continued rubbing may injure the side wall of the tires.—P. F. R.



## Wire Extension on Spout Improves Oil Cans

FOR oiling out-of-the-way places in my car, I wrapped a length of soft copper wire around the spout of an oil can so that it extends several inches beyond the tip. In use, the end of the wire is placed on the point to be lubricated. The oil is forced from the can in the usual manner, but instead of dropping free from the end of the spout, it flows along the wire to the desired place, as depicted at the right.—H. S.





# What?...AN ENGINE THAT WILL NEVER WEAR OUT!

Not quite that, of course!  
... but a perfectly amazing increase in engine life through Chrysler's new **Superfinish!**

TO CLAIM Chrysler engines will never wear out would be foolish.

But we do assert that Chrysler has doubled and tripled the life of engine operating surfaces ... achieved performance so smooth that owners of the 1939 Chryslers say, "These are the greatest motor cars ever built!"

Theoretically, if properly lubricated and kept clean, Chrysler engines ought never to wear out.

For the vital parts of every Chrysler—from brake drums to crankshaft—are **Superfinished**.



Upper: Previous commercial best ... photomicrograph of lapped surface.  
Lower: Superfinish ... smooth to 2-millionths of an inch.

And Chrysler's **Superfinish** is a new scientific process which finishes motor surfaces to a smoothness as fine as one-millionth of an inch.

Where formerly the finest processes of metal surface finishing left a "fuzz" of jagged edges, Chrysler **Superfinish** makes surfaces literally as smooth as glass.

There is no "wearing down" of bearing surfaces to get smooth operation in a Chrysler. Quietness and smooth action are scientifically assured. The original close fit of the parts is maintained. Lubrication is



These vital parts of every Chrysler are Superfinished ... pistons, crankshaft, cylinder bores, brake drums, camshaft, clutch face, tappet heads, valve stems.

perfect on a perfect surface.

How **Superfinish** is accomplished is a highly technical story. What **Superfinish** does you can see at a glance.

**Superfinish** is the greatest protection that can be given your motor car investment...it means better operation, smoother running for many extra years ... the longest lived, best running motor you ever handled.

If you are interested in the story of **Superfinish**, write Chrysler Sales Corp., Detroit, for a handsome, illustrated book and an attractive pocket piece; one side finished by fine grinding, the other **Superfinished** to the smoothness of glass.

FOR LONG LIFE

# Buy Chrysler!



# Daddy, what's a Jollop?




Young Buster and I are manicuring the lawn and chinning together when he pipes up, "Daddy, what's a jollop? Tommy Beals says we have one." Well, for the love of Mike! I happen to know Bill Beals' bus is a couple of years older than ours!

Now next door I notice Bill Beals fussing around his car, so we mosey over for a look. And there is Bill putting the final licks on as nifty a polish job as I ever saw. When my eyes get accustomed to the dazzle, I see he's been using something out of a green can with a big 7 on it.



So I take the hint and get a can, which turns out to be Du Pont No. 7 Polish. Well, I remember polishing as a tough job. But say, with this No. 7 I take years off the old bus' looks in no time. A jollop, is it? Look, before you can say "No. 7 Polish made by Du Pont," I have that car shining so bright I tell Buster to run and get my dark glasses!



 **Sample for you.** We'll gladly send you a generous sample of the improved No. 7 Polish, enough for hood and fenders. Just send 6¢, to help cover mailing costs, to Du Pont, Dept. SP-2, Wilmington, Delaware. (Offer good in U. S. only)



**DU PONT**

## NO 7 POLISH

*Improved...works even quicker, easier*

**WINDSHIELD and TOP MOULDING LEAKS** are stopped quickly and securely with DU PONT TOP SEALER. It's good for rear window leaks, too. Use the handy tube.



## TESTED BLUEPRINTS Make Boat Building Easy

THERE is still time to build and enjoy a boat this summer if you begin work at once. By using our blueprints, which are drawn to scale, you will simplify your task considerably. Some of our boat designs are listed below. We also have plans for models, furniture, radios, and miscellaneous novelties. A complete list will be sent upon receipt of a self-addressed, stamped envelope. If you are interested only in boats, ask for our illustrated boat chart.

### BOATS

|   |        |
|---|--------|
| Cabin Cruiser, 17' long, for use with outboard or inboard drives, 356-357-358-359-R.....  | \$1.50 |
| Camper's Utility Boat, 11' 2" long, canvas-covered, for outboard motor or rowing, 281-R.....  | .50    |
| Canoe, 16' canvas-covered kayak; can be used with sail, 192-193-194-R.....  | 1.00   |
| Canvas-Covered Duck Boat, 13' 6" long, 279-R.....   | .50    |
| Fisherman's Outboard Boat, 9' 3" or 11' 6" long, weighs 115 or 160 lb., for motors from 3 to 16 h.p.; can also be rowed, 344-345-R..... | .75    |
| Motorboat-Rowboat, 13' long, decked hull, for use with outboard or inboard drives, 147-R.....   | .50    |
| Outboard Racer, 10' 4" long, weighs 114 lb., for class "A" and "B" motors, 211-212-R.....   | .75    |
| Racing Sailboat BLACKCAT, 13' 4" long, weighs 250 lb., Marconi rigged, 321-322-323-R.....   | 1.00   |
| Sailboat, 12' long, weighs 200 lb.; has fast skimming-dish hull, 314-R.....   | .50    |
| Sectional Rowboat, 9' 8" long, weighs 60 lb., all-wood construction; can be used with small outboard motor, 340-341-R.....              | .75    |

### MODELS

|  |      |
|--|------|
| BLUENOSE, famous fishing schooner, 17½" hull, 110-111-112-R .....              | 1.00 |
| Clipper Ship GREAT REPUBLIC, 31½" hull, 272-273-274-R .....                    | 1.25 |
| Clipper Ship SEA WITCH, 9½" hull, 219.....                                     | .25  |
| Coast Guard Patrol of 165-ft. Type, 20½" hull, 286-287-R .....                 | .75  |
| Concord Stagecoach DIAMOND TALLY-HO, 20½" long, 115-116-117-R .....            | 1.00 |
| Confederate Raider ALABAMA, 21½" hull, 335-336-337-R .....                     | 1.50 |
| Elizabethan Galleon REVENGE, 21" hull, 206-207-208-209 .....                   | 1.00 |
| Fishing Schooner WE'RE HERE of "Captains Courageous," 9½" over all, 351-R..... | .50  |
| H. M. S. BOUNTY, 8½" hull, 254 .....   | .25  |

(Continued on page 216)



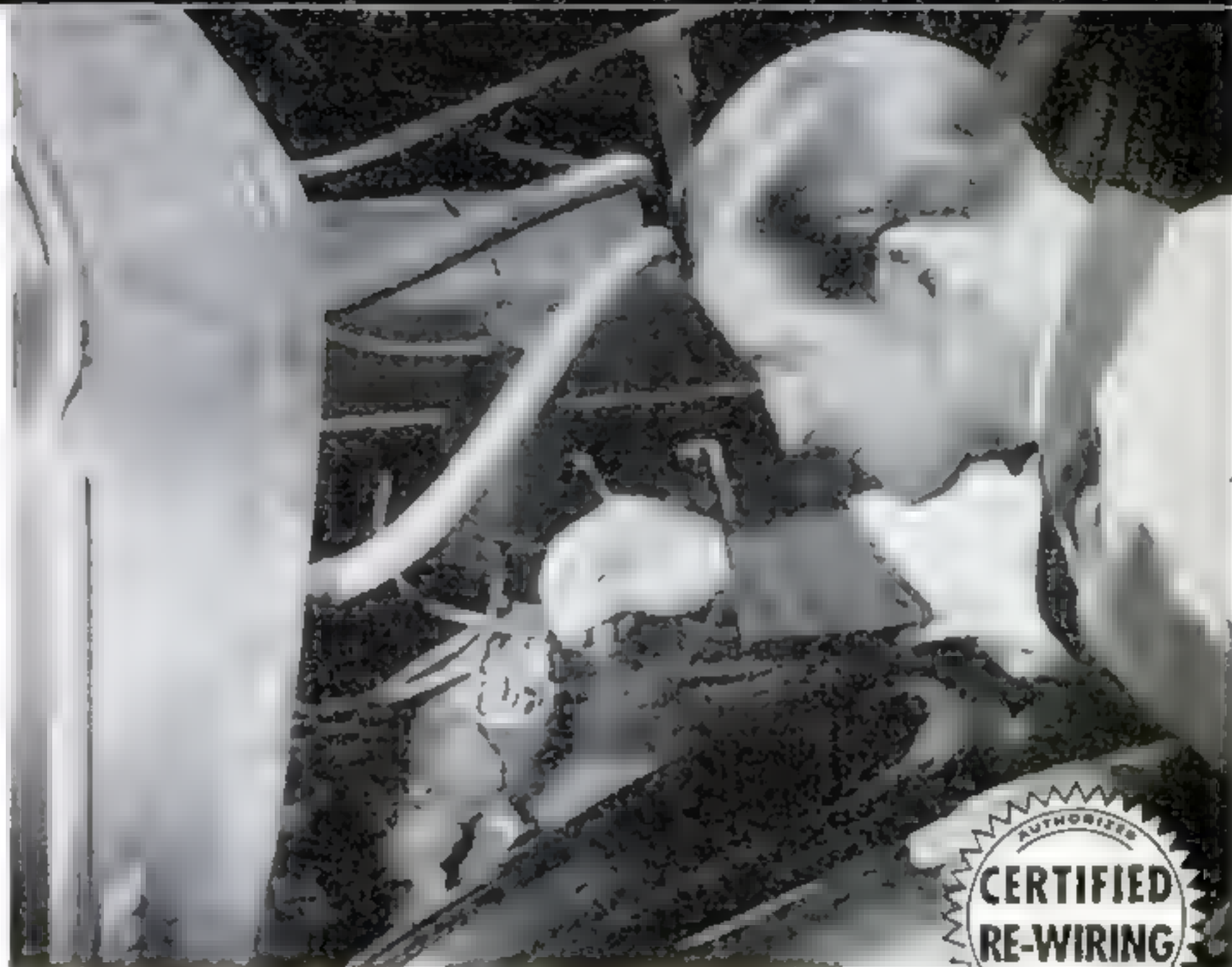
# AUTOMOTIVE MECHANICS!

## Re-Wiring Service is a BIG BUSINESS

### Become an Expert!

There is a big demand for expert electrical service. Defective cables and poor connections waste gas, reduce power and pick-up, cause hard starting, and sometimes result in dangerous fires.

You can become an expert at correcting these common troubles. All the information you require is contained in the Certified Re-Wiring Manual, "Copper Nerves"—prepared and produced by the manufacturer of Packard cable. It is the only book of its kind in the field.



**BOOST YOUR OWN IMPORTANCE** When you have studied the Certified Re-Wiring Manual, fill out the examination blank enclosed and mail to Packard Electric. In return for a passing examination, you will receive a **CERTIFICATE** imprinted with your name. This is your proof that you are a Certified Re-Wiring expert—prepared to give car owners the quality electrical service they need. It is an important job, and it will increase *your* importance.

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**CAR OWNERS**—Write for folder explaining Certified Re-Wiring Service. Shows why it pays to get electrical service from mechanics who have received their Certified Re-Wiring Certificate. Packard Electric Division, General Motors Corporation, Warren, Ohio.



24 pages! 75 illustrations! The Certified Re-Wiring Manual, "Copper Nerves," contains complete step-by-step instructions on checking the electrical circuits for corroded or undersize cable and loose or dirty connections—complete instructions on replacement procedure, using cables of the correct gauge and construction—useful information on other parts of the electrical system. A textbook that will make you an expert! A reference book you can use every day!

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**N**OT only can you buy a new Cub airplane at about the same figure as a medium-priced automobile, but you can operate it for much less. With your Cub you get twenty-five miles on a gallon of gas . . . through clean air . . . straight from point to point without curves or "stop and go" . . . at peace with the world . . . master of all you survey. Get off the ground . . . go modern . . . go Cub, the hit of the air! Over one-third of all non-military planes built in this country during the last three years were Cubs.

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See Us at the San Francisco Fair and at the Cub Factory



## Tested Workshop Plans

(Continued from page 214)

|   |     |
|---|-----|
| Liner QUEEN MARY, 10 1/4" hull, 283. ....                                     | .25 |
| NOURMAHAL, power yacht, 8 1/2" hull, 276 .....                                | .25 |
| Ocean Freighter, 14" hull, 271 .....  | .25 |
| (Construction kits are available for some of these models. Turn to page 218.) |     |

### RADIO

|  |     |
|--|-----|
| All-Wave Portable Receiver, 2 tubes, battery operated, 217-R .....                         | .50 |
| Amateur Short Wave Receiver, 3 tubes, battery or 110-volt A.C. or D.C. operation, 155..... | .25 |
| Beginner's Battery Receiver, 365A.....   | .25 |
| Full Electric Headphone Receiver (can be made compact for portable use), 130.....          | .25 |
| One-Tube Receiver, battery operated, 103.....  | .25 |

### FURNITURE

|  |     |
|--|-----|
| Double-Decker Bed, 277A.....                           | .25 |
| Early American Round-Top Stand, 191A.....              | .50 |
| Fireside Bench, Colonial, 187A-188A.....               | .50 |
| Flat Top Desk, 2' 2" by 4' 2" top (no turning), 20.... | .25 |



You will have no difficulty in building this boat with Blueprints Nos. 344-345-R, costing 75 cents

|   |     |
|---|-----|
| Floor Lamp, with tripod base, 243A.....   | .25 |
| Four-Leaf Card or Occasional Table, 239A.....                                     | .25 |
| Hanging Wall Cabinet, 9 1/2" by 24" by 41 3/4", 280A....                          | .25 |
| Magazine Rack, ladder-back style, 250A.....                                       | .25 |
| Silverware Chest on Stand, 256A.....  | .25 |
| Smoking Stand, modern, 238A.....  | .25 |
| Tea Wagon, with removable tray and drop leaves, 20" by 30" top (turning), 13..... | .25 |
| Upholstered Stool, 240A.....  | .25 |

### MISCELLANEOUS

|   |     |
|---|-----|
| Acrobatic Monkeys Toy, One-Legged Table, and Hat and Coat Rack, 248A..... | .25 |
| Baby's Crib and Play Pen, 26.....   | .25 |
| Birds and Animals, jig-saw patterns, 56.....                              | .25 |
| Colonial Design Doll's House, 72.....                                     | .25 |
| Doll's House Furniture, 73 .....  | .25 |
| Electric Teacher, (question-and-answer game), 302A .....                  | .25 |
| Microscope Kit, portable, 220.....  | .25 |
| Projector for Photos and Pictures, 259A.....                              | .25 |
| Six Simple Block Puzzles, 65.....   | .25 |

### LEAFLETS AND BOOKLETS

|  |     |
|--|-----|
| Home Workshop Index for 1937.....                                      | .10 |
| Home Workshop Index for 1938.....                                      | .10 |
| How to Build and Operate an Inexpensive Arc Welder and Spot Welder.... | .50 |
| How to Make Your Own Marionettes.....                                  | .50 |
| Resilvering Mirrors at Home (leaflet).....                             | .10 |
| Workbenches and Tool Cabinets (leaflet).....                           | .10 |

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WITH CLEARANCES  $\frac{1}{2}$  THE THICKNESS OF  
A CIGARETTE PAPER—THE LIQUID FILM  
OF THE FINEST OIL CAN BREAK!



YOU CAN NEVER BREAK MOBILLOIL'S  
"3-FILM" PROTECTION



"IT'S A MYSTERY TO ME," motorists often say, "why  
some cars run better than others."

Oil can be that reason. Especially in hot-running,  
close-fitting modern motors!

Protection from wear is vital. Mobiloil does that  
with 3 films. It *also* resists gum, carbon, wasteful  
"oil drag." You get *all* good oil qualities . . . not  
just one or two! Socony-Vacuum Oil Co., Inc.



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*"In the good old Summertime"*

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LIKE TO GET OUT AND GET UNDER to keep the old bus hitting on all 12? This file is single-cut on one side for finishing jobs, double-cut on the other for fast metal removal. Hang one up in your garage!



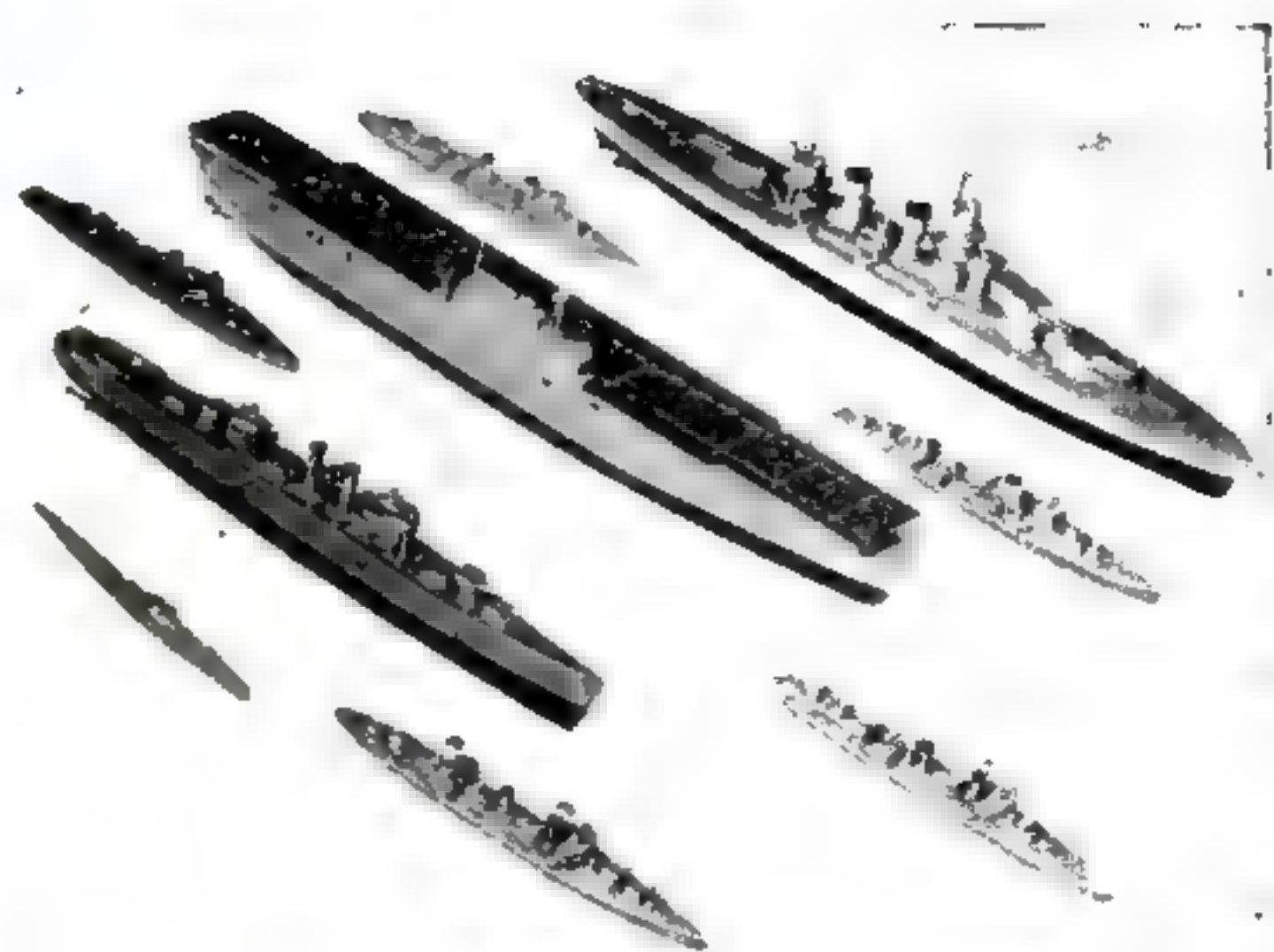
GIVE THE WEEDS A TREAT with a hoe that's really sharp! The single-cut side of your Handy File is ideal for all kinds of sharpening jobs. Rounded handle makes it safe to carry in your pocket.



SOMETHING WILL NEED TINKERING around the boat or summer camp. Better take along a Handy File and be prepared.

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A FILE FOR EVERY PURPOSE



## The Fleet's In!

### NEW KIT CONTAINS MATERIALS FOR BUILDING NINE MODELS OF LATEST U. S. FIGHTING SHIPS

TO SAFEGUARD this country in the world-wide armament race, the United States is rushing to completion many new fighting craft, and others are already in commission. You can build nine models of these much-discussed ships with our kit No. 7M, which has just been added to the POPULAR SCIENCE "Model-of-the-Month" series.

Costing only \$1.50†, the kit contains all the raw materials for making miniature models of the superdreadnought *Washington*, light cruiser *Philadelphia*, aircraft carrier *Yorktown*, destroyer flotilla leader *Winslow*, four destroyers similar to the *Mahan* and *Gridley*, and submarine *Pompano*, as shown above.

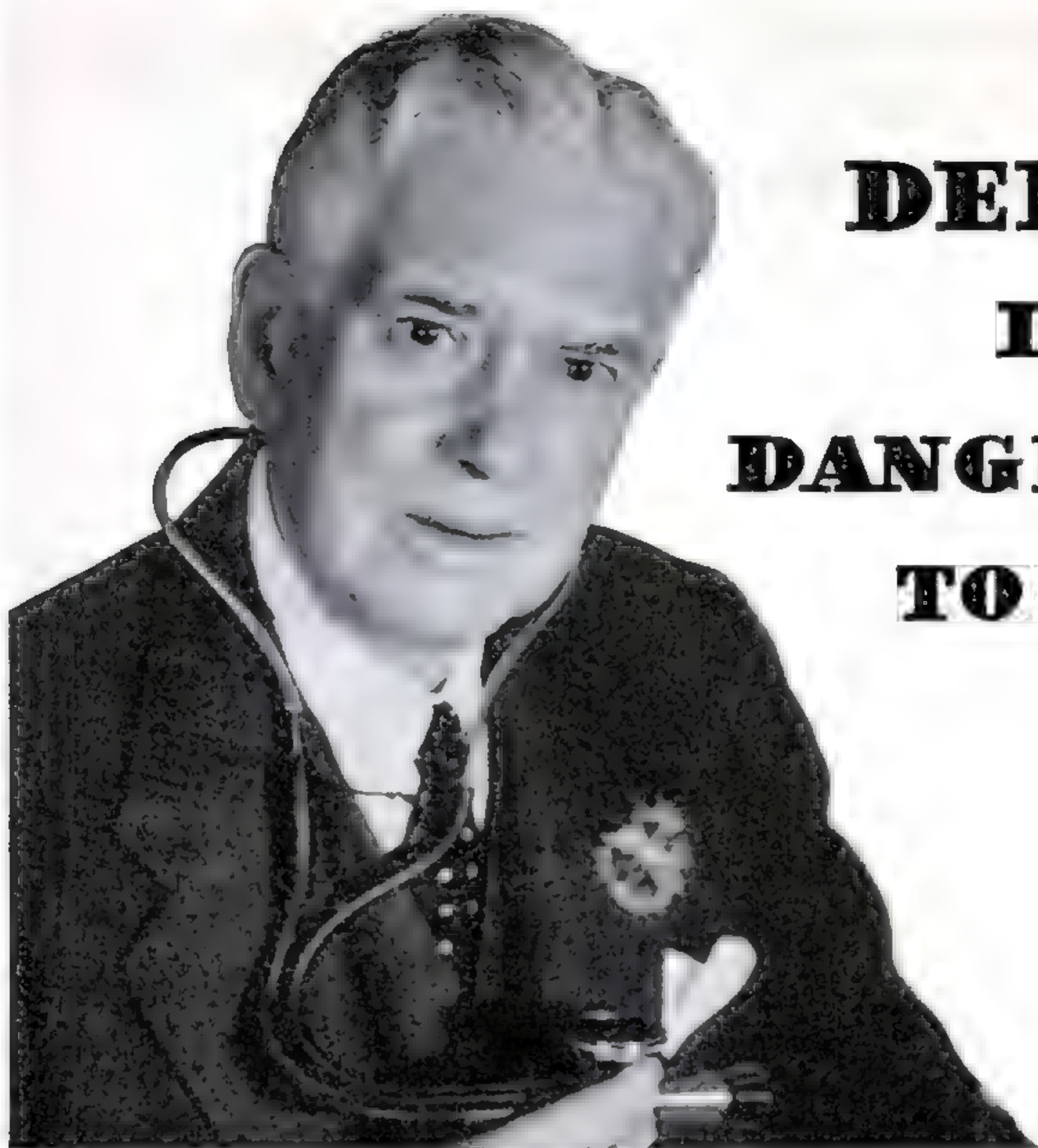
The models are built to a scale of 1" equals 100', but despite their small size contain all the important characteristics of their prototypes and are very realistic. The largest ship is the aircraft carrier, which is 8" long; the smallest is the submarine, 3" long. A twelve-page booklet with full-size drawings and complete instructions for building the models is included with each kit.

For those who prefer larger models, we have six other kits for making naval models. Three of them have appeared in our "Model-of-the-Month" series. They are Kit M, aircraft carrier *Saratoga*, 18" long, \$1.00; Kit N, convoy of four destroyers for the *Saratoga*, each 6¼" long, 75 cents; and Kit R, cruiser *Tuscaloosa*, 11¾" long, \$1.00.

A simplified model of the cruiser *Indianapolis* can be made with Kit H, which costs \$1.50. The model is 12" long.

The powerful battleship *Texas* can be  
(Continued on page 220)





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little services, often neglected, but vitally important to carefree, safe driving.

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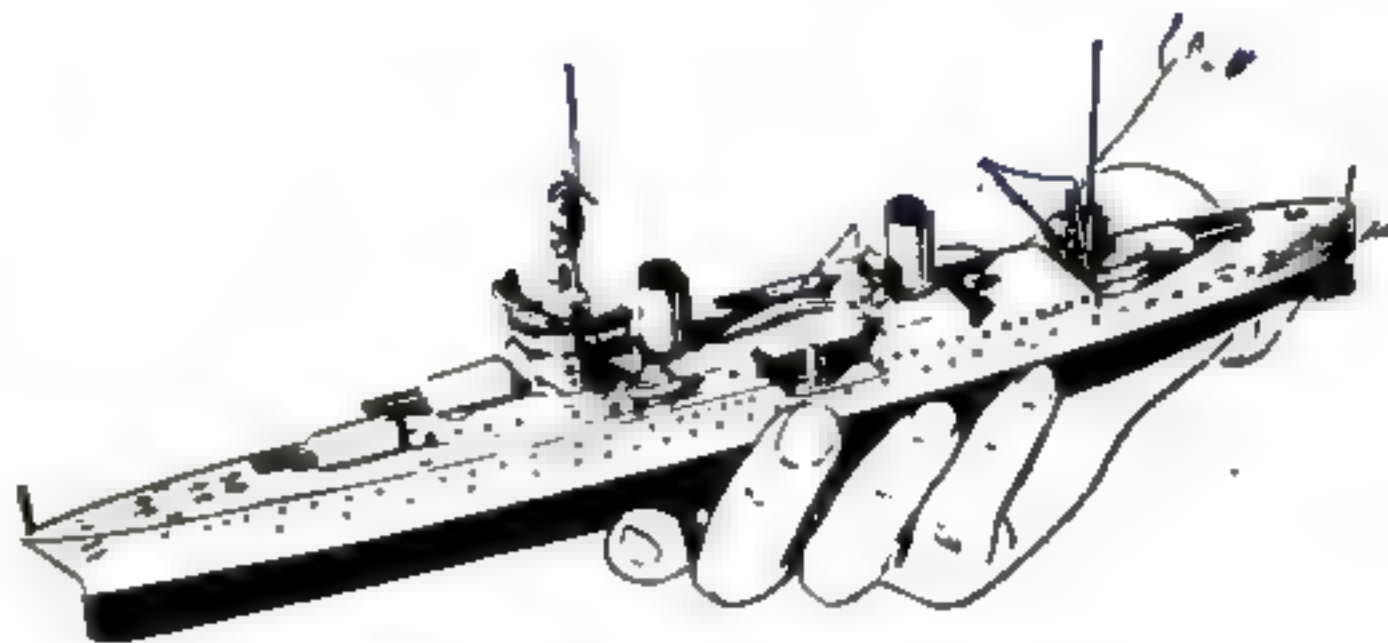
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BY THE MAKERS OF MOBIL OIL

## New Construction Kit

(Continued from page 218)



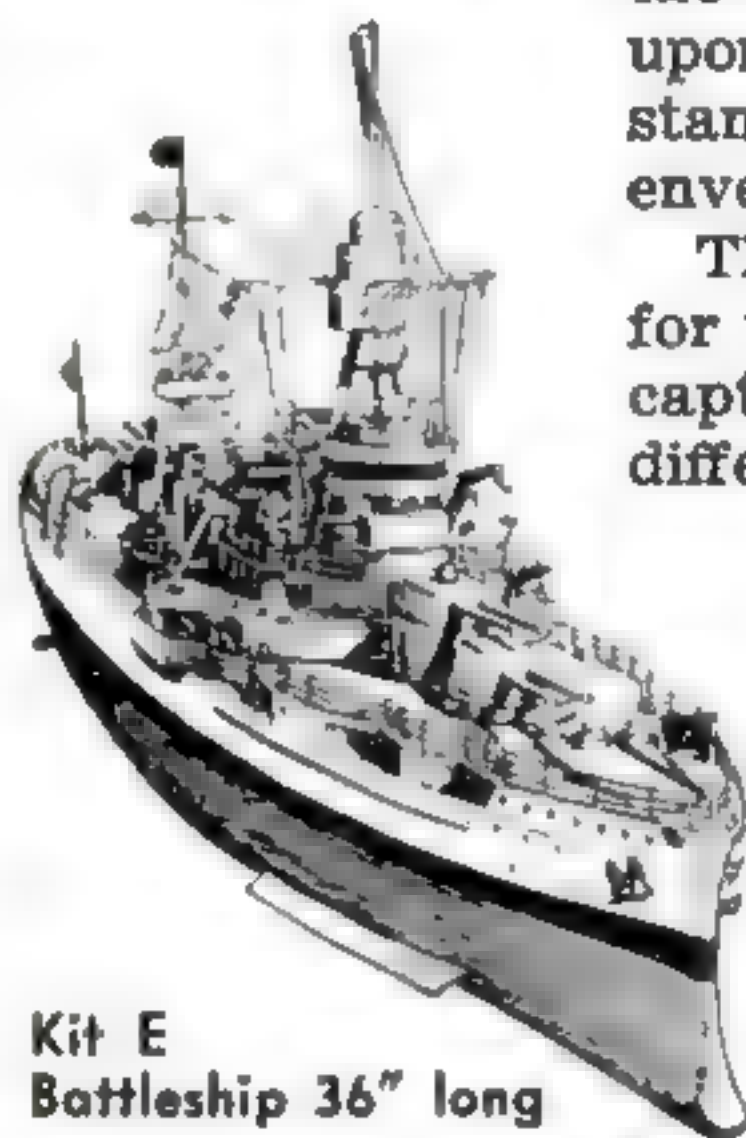
Model of cruiser "Indianapolis" made with Kit H

constructed with Kit E, price \$7.45\*. It is a carefully detailed scale model, 3' long. Another elaborate model is the destroyer *Preston* made with Kit 2S, price \$5.95\*. It is 31½" long.

We also have kits for decorative ships such as the whaler *Wanderer* (Kit A, \$7.40\*), Spanish galleon (Kit D, \$6.95\*), Farragut's flagship *Hartford* (Kit L, \$8.45\*), clipper *Sovereign of the Seas* (Kit V, \$4.95†), and fishing schooner *Bluenose* (Kit 8S, \$4.95†). A complete list appeared on page 220 of the May issue. An illustrated leaflet describing

the kits will be sent free upon receipt of a large, stamped, self-addressed envelope.

Three kits are available for whittlers: Kit 7, a sea captain, \$1.50; Kit 8, six different Scotties, \$1.00; and Kit 10, *Hobo Hank*, \$1.50. The latter contains a composition model, which you duplicate on a whittling block, and wood for making a desk set.



Kit E  
Battleship 36" long

Note: If you live west of the Mississippi River or in Canada, add 50 cents to prices marked with an asterisk (\*) and 25 cents to prices marked with a dagger (†).

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We, Champion Spark Plug dealers everywhere, extend to you this invitation to bring your car to one of us during National Spark Plug Change Week for a check-up of your spark plugs. We will test them, clean them, and show you how old, worn spark plugs waste gas and oil; why a new set of Champions will soon save their cost and insure quick starting, faster acceleration and all around better engine performance.

Our new Sillment-sealed Champion Spark Plugs permanently eliminate troublesome leakage common to ordinary spark plugs. We strongly urge every motorist, not using these new and improved Champions, to install a set now—especially if your present plugs have gone 10,000 miles or more—because even one “leaker” in a set can cause rough, uneven, and wasteful engine operation.

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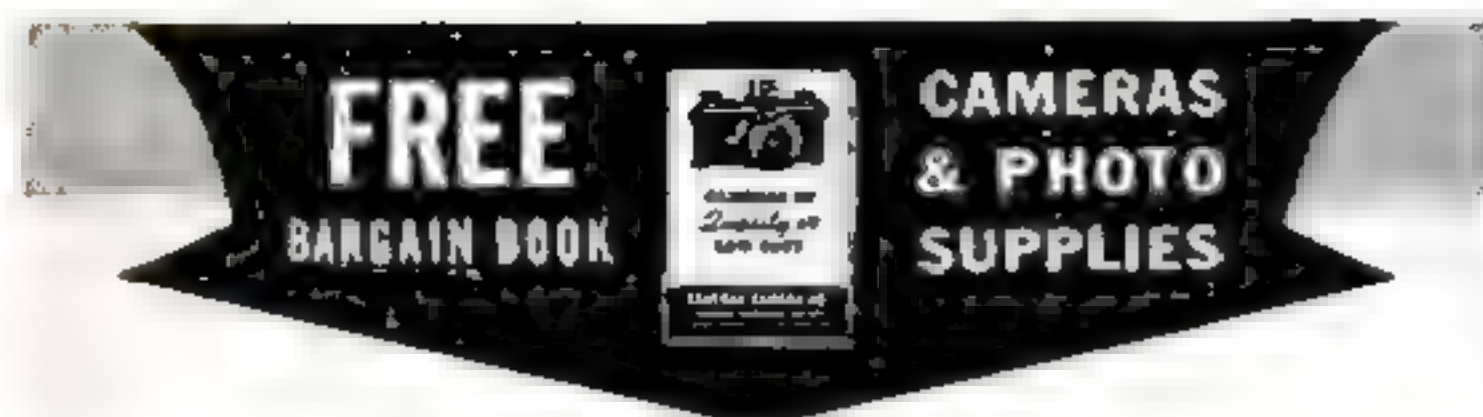
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V-2  $\frac{1}{4}$ "  
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## Turning Camera on Tripod to Follow a Subject

CUT in the shape of a paddle from thin pressed composition wood or similar material, the handle illustrated above enables a camera used on a tripod to be turned easily to follow the subject. A hole must be drilled through the handle, of course, through which the tripod screw can pass.—K. M.

## Blocking Parts of Negatives

ORDINARY liquid stove polish, applied with a brush, is a satisfactory and readily available opaque paint for blocking out sections of negatives. It will not chip off and is waterproof, although a good grade of gasoline or benzine will remove it if necessary.





# 4

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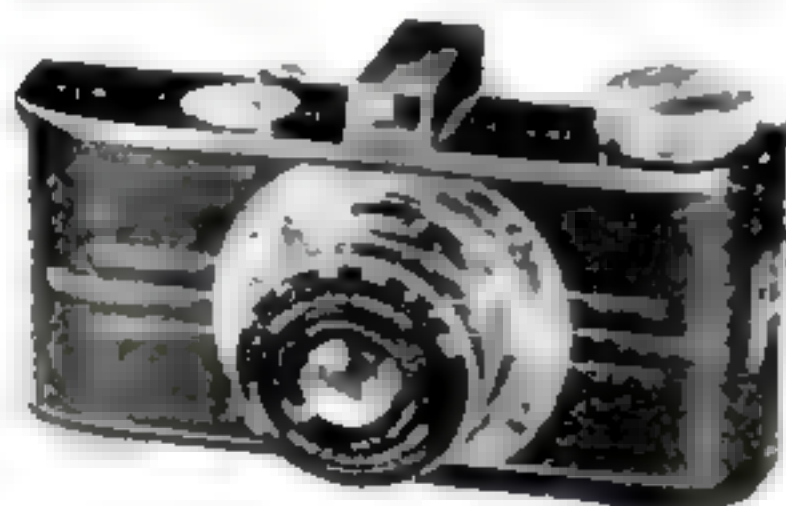
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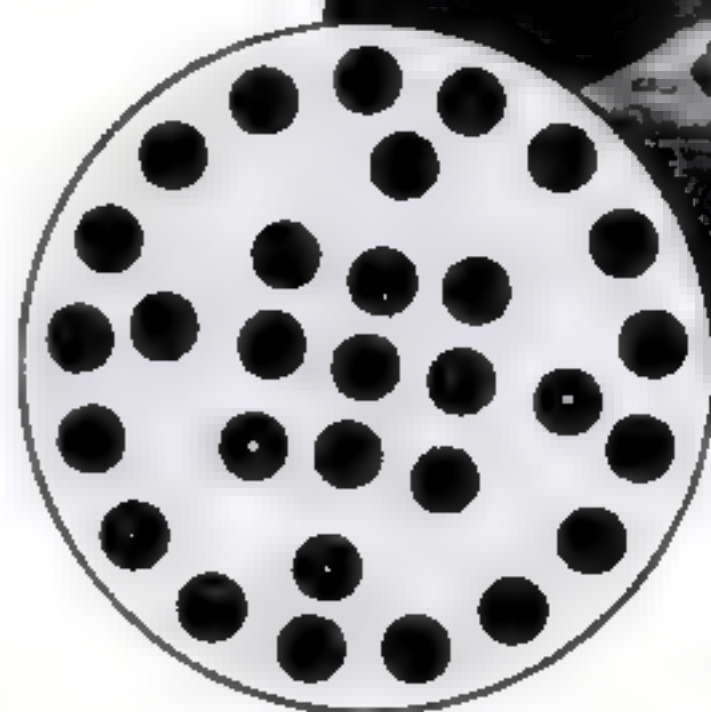
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The illuminated polka-dot pattern aids in focusing sharply on ground glass

## Flash Light Helps Focus Camera in Dim Light

**C**OUNTLESS photoflash bulbs are wasted on indoor pictures because amateur photographers find it difficult to focus accurately, especially if they are using cameras of foreign manufacture with metric focusing scales. A definite way to focus, no matter how dim the light, may be provided, however, by using an ordinary pocket flash light.

Cut a circle of thin paper to fit inside the flange holding the flash-light lens. Prepare a number of  $\frac{1}{4}$ " disks of black cardboard or any nontransparent stock (this can best be done with a  $\frac{1}{4}$ " round-hole punch) and glue them on the white paper to form a pattern such as that illustrated above. Insert the paper in front of the flash-light lens with the small black disks facing outward.

The flash light is merely placed beside the subject and switched on so that you can focus on the brightly illuminated polka-dot pattern. This is clearly visible on the ground glass of the camera even in places where the normal light makes it impossible to see anything but a faint image.—J. J. MIHOK.

## Dissolving Sodium Carbonate

**SODIUM** carbonate, which is a common chemical much used by photographers, has a marked tendency to form lumps, and these will not dissolve quickly. To reduce the lumps to the original granulated form, simply rub them on the inside of an ordinary wire-mesh tea strainer.—C. L.







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With the Bausch & Lomb Film Slide Viewer, you don't need darkened room or projection screen to view miniature film slides. Just plug in any light socket. Without focus or adjustment, you see your slides, large, bright, clear. Molded bakelite body, brown, black or green, \$8.50. Each handsome volume (\$2.50) of the Miniature Slide Library holds 100 2 x 2" slides, numbered and indexed. *Write for descriptive folder.*

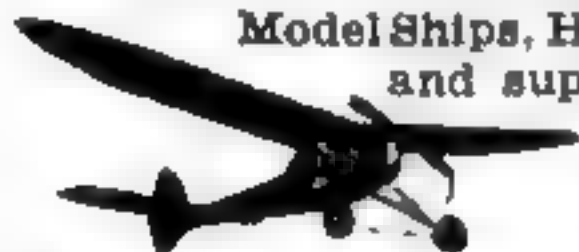
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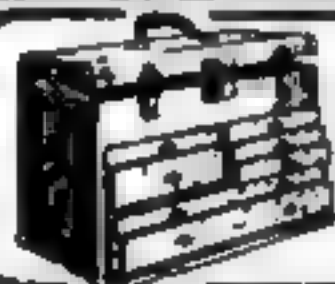
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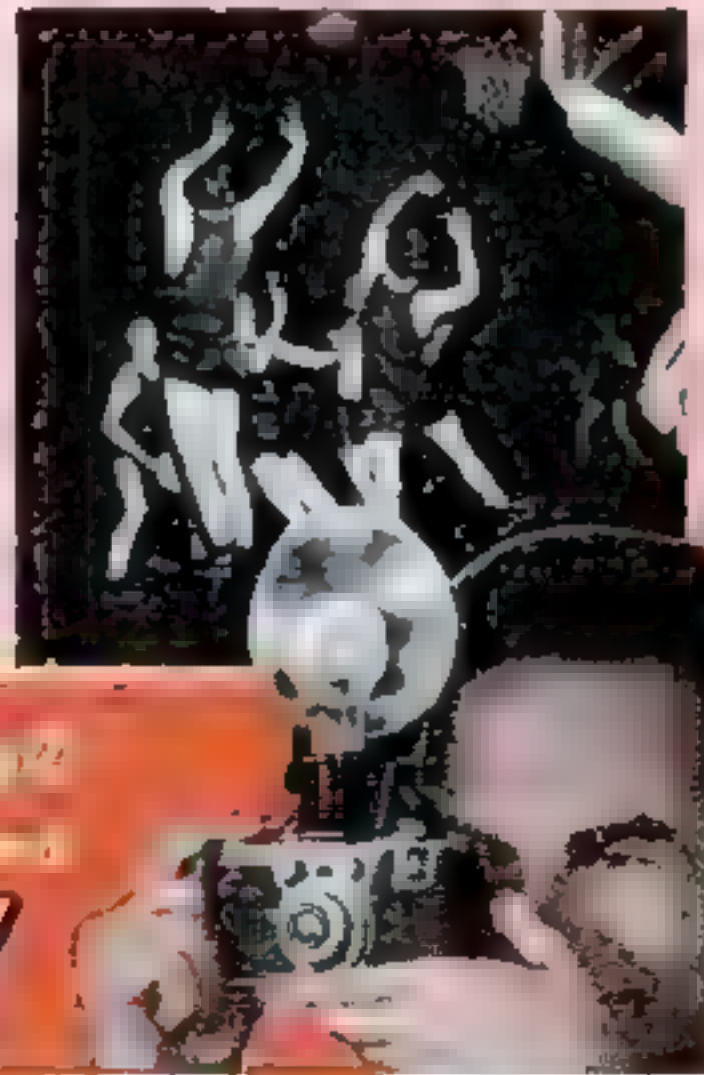
If you've been looking for a super-speed candid that takes exciting pictures by day or night, here's great news! The sensational new Univex Mercury, at only \$25, gives you the lightning speed, precision performance and breath-taking results you'd expect only from foreign-made candid costing \$100 and more! 1/1000th-of-a-second shutter speed—to stop and hold breathless action at its peak! New automatic film transport to make double exposures impossible! And to cap the climax—this amazing new Mercury cuts your negative costs in half, because it uses economical Univex 35 mm. film! See the Univex Mercury at your dealer today, or send for free illustrated booklet! Universal Camera Corp., Dept. M-18, New York City.

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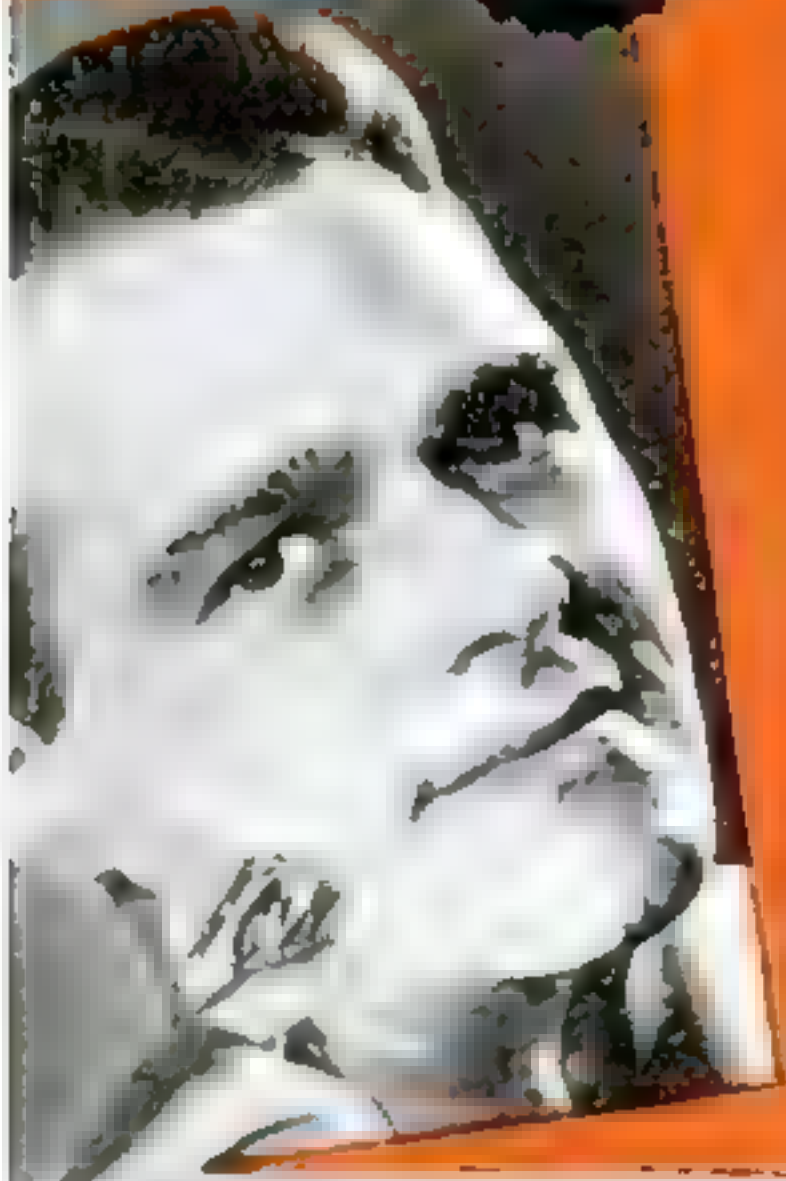
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## New Clews Aid Search for Oak Island's Gold

(Continued from page 109)

be accomplished, workmen had to fell nearly half a hundred trees.

Instead of leading out into the water, as was half expected, the line ended at an overgrown tangle of vegetation near the south shore. The vegetation was cleared away. Beneath, glacial boulders arranged in the shape of a rough arrowhead, approximately ten feet broad at the base and nine feet long on either side, pointed north. Setting up his transit and measuring off distances, the surveyor found the money pit lay almost exactly fourteen rods due north from the arrowhead. Thus, using the drilled stones as starting points and following the directions given on the Kidd map, the surveyor had arrived at the treasure site where, incidentally, a giant tree had stood when the spot was first discovered.

Fascinating as this discovery is, it does not provide a final answer to the riddle of Oak Island. What treasure will be found far below the surface of the earth is still a matter for conjecture; the secret of the flooded money pit is still a mystery.

As soon as it became known that Hedden and his associates were planning a new attack upon the money pit, letters began to pour in with original ideas for overcoming the unique problems at the island and with offers of assistance. One man, for example, suggested that Hedden freeze the whole island and thus halt the flow of sea water. Another sent a letter all the way from Scotland. He had, he said, inherited a divining rod from his great-grandfather. If the syndicate would pay his passage to America, he would bring the magic rod to Oak Island and trace the exact path of the sea-water conduit. A third correspondent stated that he was the inventor of a remarkable "treasure smelling" mechanism. Carried in an airplane, it indicated exactly where gold would be found in the earth below. He wrote to say that he had just flown over Oak Island and the attraction of the vast treasure below was so great the delicate machine had been broken to pieces!

Hedden has his own scheme of attack carefully worked out, and a picked crew hired to help him. Starting at the bottom of the money pit, he plans to "fan out" with powerful pneumatic drills. Like twenty-foot fingers of steel, they will probe the earth on all sides of the shaft, radiating out like the spokes of a wheel. When such a "wheel" is completed at one level, the drills will be

(Continued on page 228)



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**LOOK AT IT! . . .** Daisy's brand-new, grand NEW LIGHTNING-LOADER CARBINE . . . a 500 Shot Repeater . . . with three sensational "**FIRST-IN-HISTORY**" features: (1) *The first and only ADJUSTABLE DOUBLE-Notch Rear Sight* for long and short range shooting, target or "snap" shooting! (3) *The first and only genuine Old West Style CARBINE* in Daisy air rifle history! Looks, feels and shoots like the powerful carbines used by famous Frontiersmen! Other special new features: Husky wooden Fore-piece for steadier aim and rich walnut-finish Pistol Grip stock. **AND—**how your heart will thump and jump for joy when you learn **LIGHTNING-LOADER CARBINE** costs you only \$2.50 . . . the most air rifle and the most fun for the least money! Hurry—get your new Daisy CARBINE now at the nearest hardware, sporting goods, department store! (If your dealer hasn't it in stock, rush \$2.50 to us and we'll mail your new carbine postpaid!)

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## New Clews Aid Search for Oak Island's Gold

(Continued from page 226)

moved two feet higher and the process repeated. At their outer extremity, the holes will be no farther than two feet apart. Thus, no object such as a treasure chest, larger than two by two feet, can escape being encountered by the drills.

If the cores brought into the shaft by the hollow steel tubes show anything suspicious, a horizontal tunnel will be run out and the area explored thoroughly. Powerful gas-driven compressors will operate at the top of the shaft to supply power for the drills.

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## POPULAR SCIENCE Question Bee

How did you make out in the Question Bee on page 134? In the list below, letters indicate the right answers to the numbered questions. Give yourself five points for every correct answer. A score of 75 to 85 points is good; 90 or better is excellent.

- |      |      |       |       |       |
|------|------|-------|-------|-------|
| 1. b | 5. d | 9. b  | 13. c | 17. c |
| 2. d | 6. b | 10. c | 14. d | 18. b |
| 3. a | 7. c | 11. b | 15. b | 19. d |
| 4. b | 8. b | 12. c | 16. c | 20. b |



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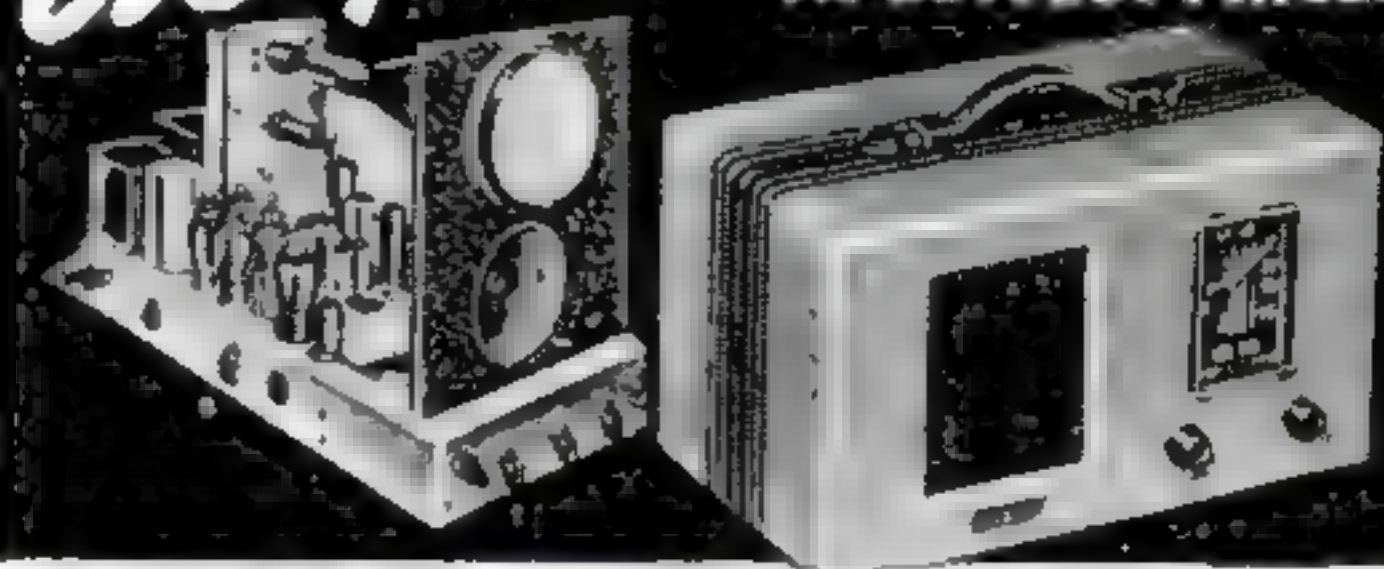
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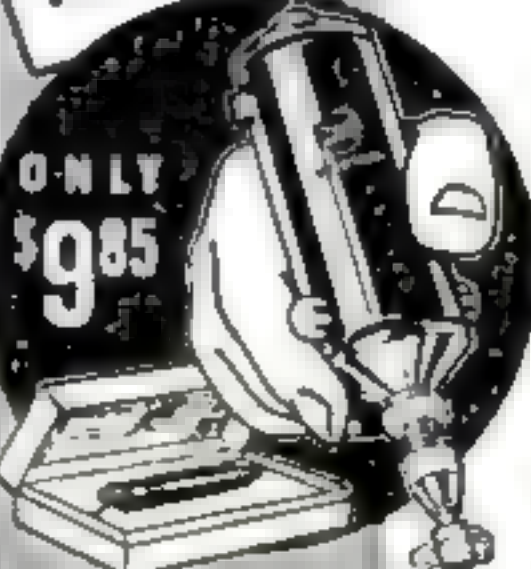
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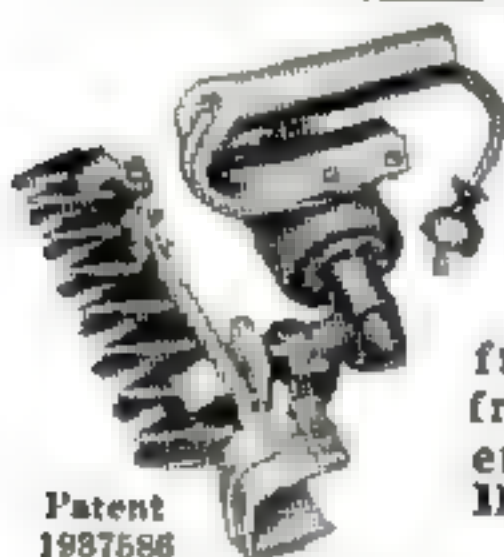
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**3-IN-ONE OIL**

## Hobbyist Creates Modern Swords of Damascus

(Continued from page 67)

Dr. Carnes was able to engage actually in the search for a modern way of making a Damascus sword blade. After receiving his degree in dentistry, he became a salesman of dental and surgical equipment, and later the owner of a cutlery firm. This gave him the opportunity he had been waiting for so long—the facilities for experimenting with steel.

Through many years, Dr. Carnes studied and experimented. He tried various combinations of carbon with iron, in an attempt to produce the required blade. He could, without much trouble, make a sword blade with an edge so keen that it would shave the most wirelike hair like a razor, or one so flexible that it could be bent double; but to combine these two qualities in the same blade was another problem. Then vanadium became available, and he set to work with its help to reach his goal.

He found that the secret of making a modern counterpart of Damascus steel lies in simple little tricks of treatment during manufacture and tempering. The final steel, containing vanadium, chromium, and other elements, is made in an electric furnace.

Dr. Carnes made quite a number of blades before duplicating the legendary Damascus swords in performance. His swords do not have handles made from human thigh bones as did the originals. The blades take a beautiful polish but are not stainless, and have to be protected from the rust that has destroyed nearly all the true Damascus swords.

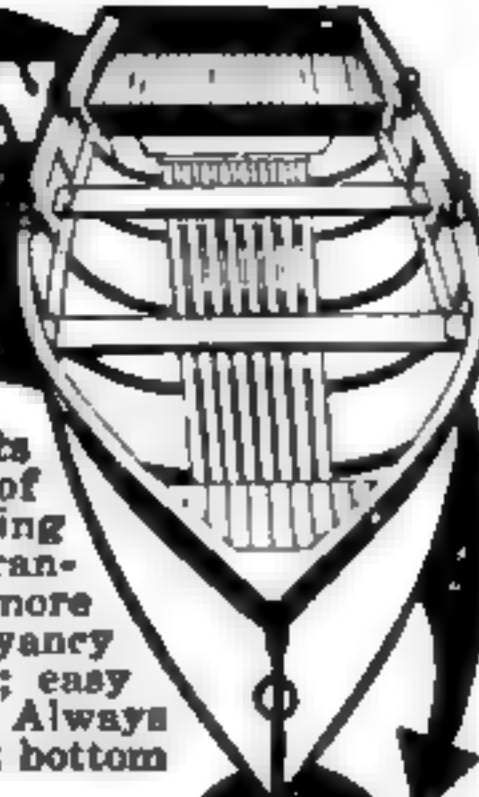
To prove that his "Damascus" steel was not merely an accident, and that its production can be controlled, Dr. Carnes has made a sample strip that exhibits five kinds of tempering. It is a one-piece band of steel about fifteen inches long and an inch wide. One end is so hard that it will cut glass like a diamond. Drop back three inches, and there is an edge so keen it will shave hair. Another three inches brings a region that is hard without being brittle, and will cut nails in two like a cold chisel, without nicking. The next three-inch portion is tempered so that it will bend like a spring, and return to its original position. The last section is soft and tough, so that it can be bent back and forth repeatedly without breaking.

Dr. Carnes experimented with the steel in other forms, as paring knives and pocket-knife blades. With the paring knives he made, he can cut spikes in two; and he can drive the pocketknife blades through a one-eighth-inch plate of steel without even as much as nicking.

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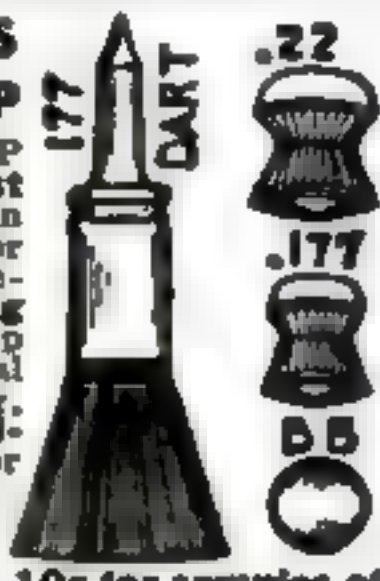
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## Some Tail-light Troubles

(Continued from page 140)

light switch and wire up to the coil side of the ignition switch, and through the coil and points to ground. By doing that it provides enough ignition current to keep the engine running after the switch has been turned."

"But why," demanded Hubbard doubtfully, "has the lighting current just begun to do that? I've never had any trouble of this sort before."

"Normally," Gus explained, "the lighting current grounds at the tail lamp. But it isn't grounding there now. Something—some little thing, in all probability—has happened that prevents it from grounding." He got up and switched on the shop lights. "If you'll just drive your car into the shop, Mr. Hubbard," he suggested, "I'll have the trouble cured in ten minutes."

Hubbard drove in. Without even glancing at anything else, Gus examined the tail lamp. Then he nodded.

"The bolts that hold the lamp to the bracket have shaken loose," he said, "and the bracket itself is very dirty. The lighting current can't ground. That's the full extent of your trouble."

He cleaned the bracket, and tightened the bolts. "Now try her," he said.

Hubbard started his engine, turned on the lights, applied his hand brake hard, and switched off the engine.

The engine stopped.

"Now it's all right," Gus said. "The lighting current is grounding through the lamp bracket, as it should, instead of going on to the coil. You won't have any more trouble, Mr. Hubbard."

"If I do," said Hubbard, "I know where I'll come with it!"

"Queer, wasn't it?" Gus said when Hubbard had left. "We haven't had a job in which a tail light was causing the trouble in two or three years, and now we get two of them in one week."

"More important," Joe said, "we get two new customers."

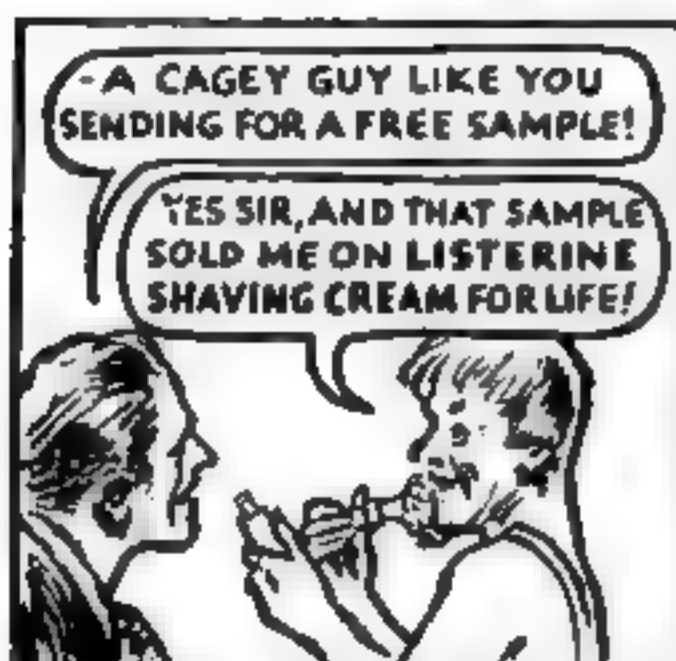
Gus grinned. "How much a year do you figure," he inquired, "we'll make out of old Barnstable?"

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## Hints for Beginners in Amateur Chemistry

(Continued from page 197)

point desired. Connections between pieces of glass tubing may be made with short lengths of rubber tubing.

For your wash bottle, mentioned earlier, fit a good-size jar or chemical flask with a two-hole stopper carrying two bent pieces of glass tubing. The longer, reaching to the bottom of the water-filled flask, should have a small nozzle for a tip. When you blow into the other, which reaches only to the bottom of the cork, water will squirt from the nozzle into a test tube or other vessel.

To store your laboratory apparatus, you can press into service a discarded kitchen cabinet, a chest of drawers, or an old wardrobe fitted with wooden shelves. An ideal storage cabinet would be a double-size steel locker, or kitchen cabinet, of a type sold widely in department stores.

Chemicals and apparatus may be purchased according to your requirements, as you progress with your hobby, from a number of chemical-supply houses that handle mail orders. Some drug stores in large towns also specialize in stocking a wide variety of laboratory supplies, and even the nearest corner pharmacy will be able to provide a number of the chemicals that you may need.

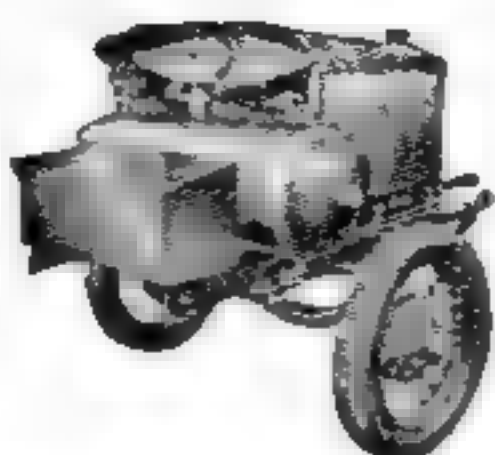
A list of some of the chemicals most frequently used in home experiments might read as follows (the strong acids listed are to be handled with particular care):

Ammonium chloride; ammonium hydroxide (household ammonia can be used); barium chloride; calcium carbonate (marble); calcium oxide (lime); cobalt chloride; cupric chloride; cupric oxide (black copper oxide); cupric sulphate; ferric chloride; ferrous sulphate; ferrous sulphide; hydrochloric acid; lead acetate; magnesium metal (in ribbon form); magnesium sulphate (Epsom salts); manganese dioxide; manganese sulphate; nickel ammonium sulphate; nitric acid; phenolphthalein (one-percent alcoholic solution); potassium chlorate; potassium dichromate; potassium iodide; potassium nitrate; potassium permanganate; potassium thiocyanate; silver nitrate; sodium bicarbonate (baking soda); sodium bisulphate; sodium carbonate (washing soda); sodium ferrocyanide; sodium hydroxide (lye); sodium silicate (water glass solution); sodium thiosulphate; sulphur; sulphuric acid; zinc metal.

In coming articles, some of the fascinating experiments that you can perform with these and other items of your chemical equipment will be described.



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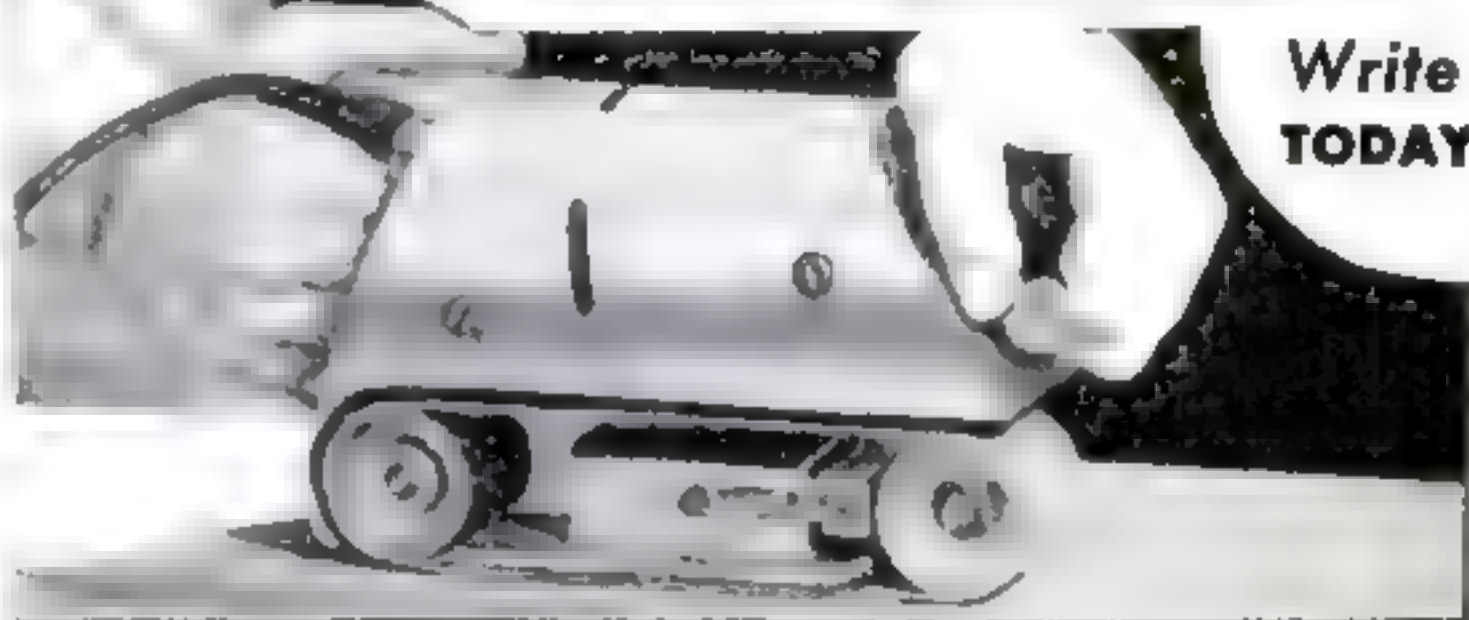
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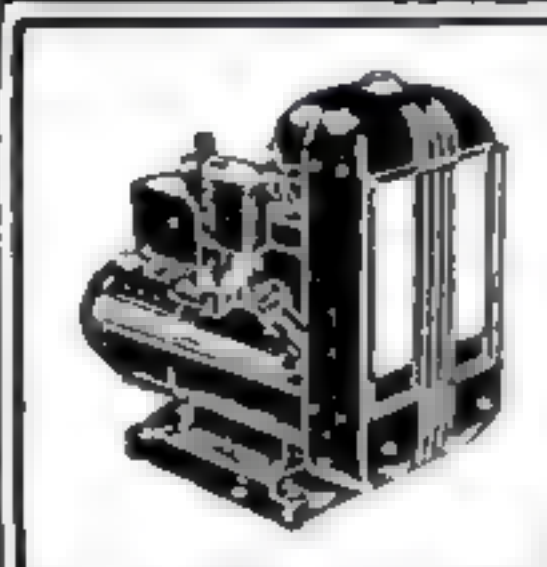
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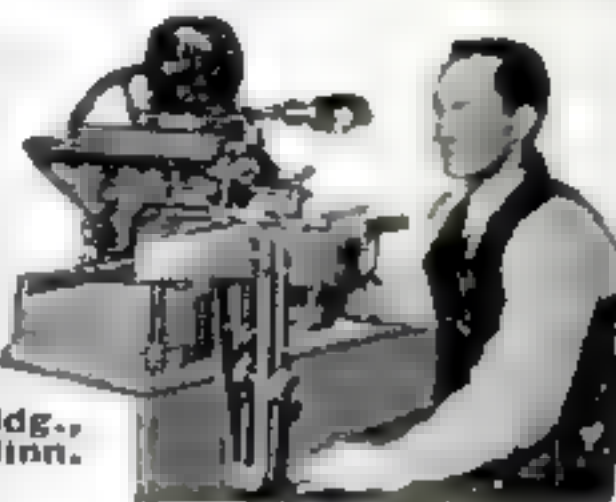
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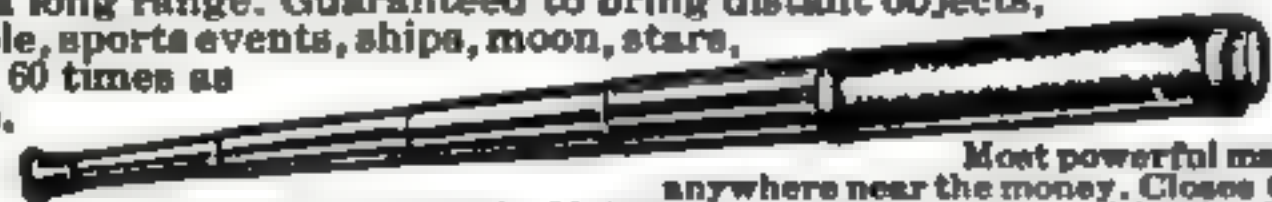
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## Everyday Jobs for Your Microscope

(Continued from page 203)

ing from above or by reflected light from the substage mirror. Ordinarily, rather low magnifications are sufficient.

In previous installments of this series the use of a microscope for checking grain, blemishes, and other details of photographic negatives and color transparencies has been described.

The tool maker, either amateur or professional, can use a microscope every day. Take, for instance, a man who makes rotary files, those tools that look and act like dentist's drills, and are used in industry for making molds, carving wood, and machining airplane-engine parts. An important step is the hardening of the files after the teeth are cut. A few degrees too much heat, and the edges of the teeth become rounded instead of remaining angular. With a microscope, the finished tools can be checked to determine whether they are of maximum sharpness.

A microscope equipped with a micrometer eyepiece or a calibrated mechanical stage can be used for checking the accuracy of the scales on steel rules and similar tools (P.S.M. Nov. '36, p. 48).

If you are a student engaged in learning the details of some subject such as radio engineering, you may find a microscope helpful in studying the construction of minute parts like the grids, filament supports, and plates of radio tubes. Usually a strong light striking the stage at an angle from above—as, for example, the beam from a small spotlight—is the best form of illumination. Sometimes two light beams are better, because they eliminate deep shadows. The small illuminator described in the February 1939 issue is excellent for this.

And, of course, you can employ a microscope to examine liquids—to see whether there is much solid matter in lubricating oil, for instance. Simply put a drop of the oil on a slide, lower a cover glass over it to spread it out into a thin, uniform film, and examine by transmitted light.

There are countless other ways in which a microscope, whether it be an inexpensive amateur instrument or a high-priced research job, can be employed with benefit in the performing of everyday activities and the solving of everyday problems. Often the smaller amateur 'scope has the advantage because it can be carried around easily and because its magnifying power is low enough to make it useful. Very often, a magnification of fifteen to fifty diameters is all that is required for satisfactory results.



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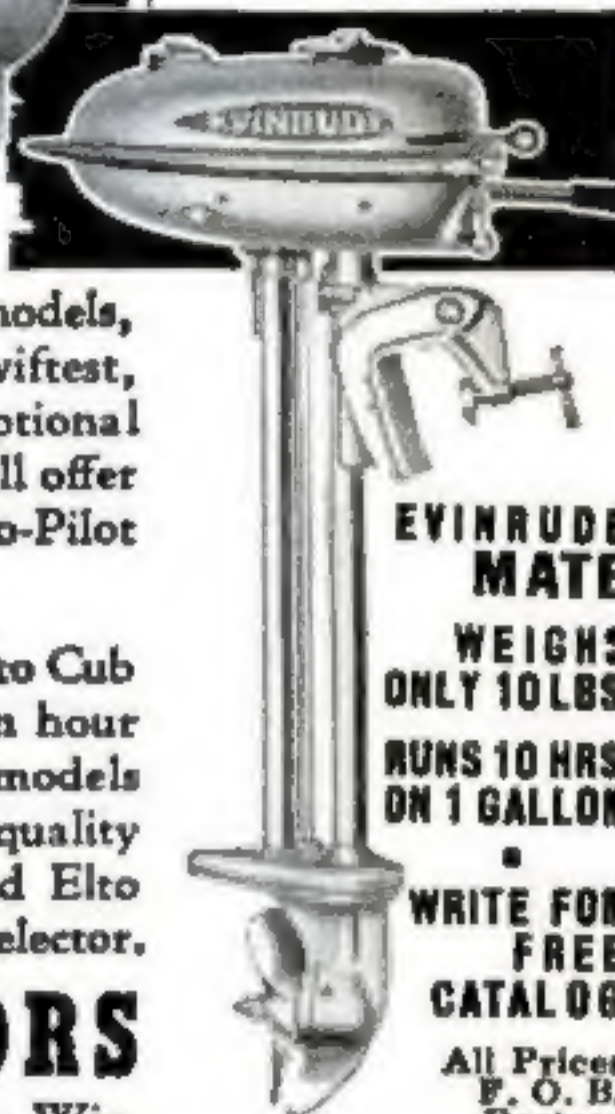
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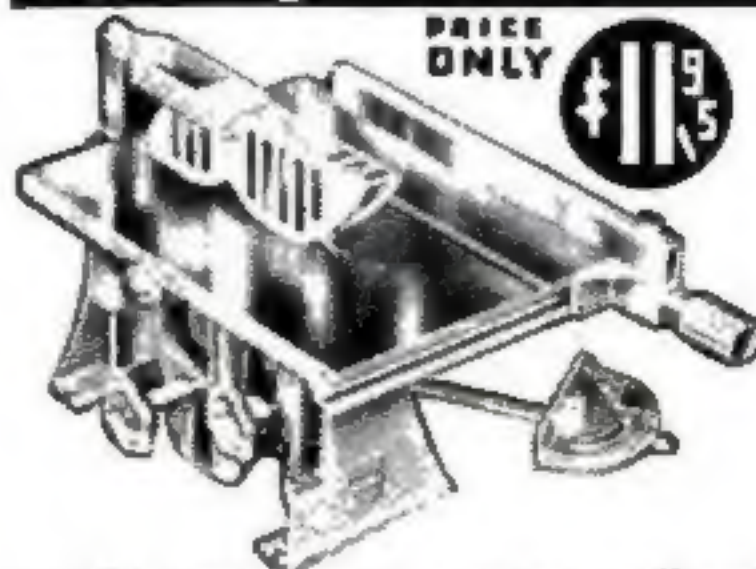
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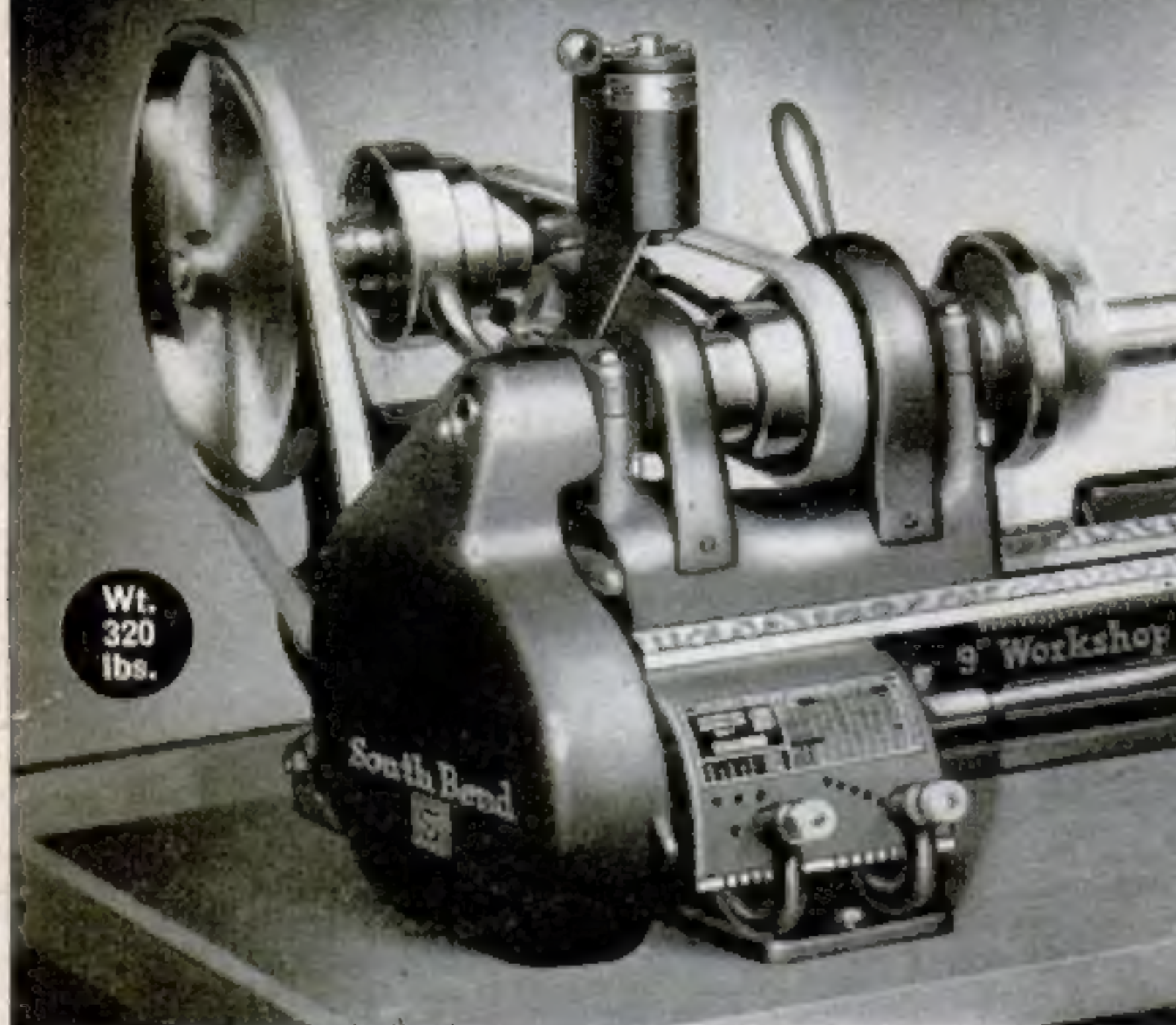
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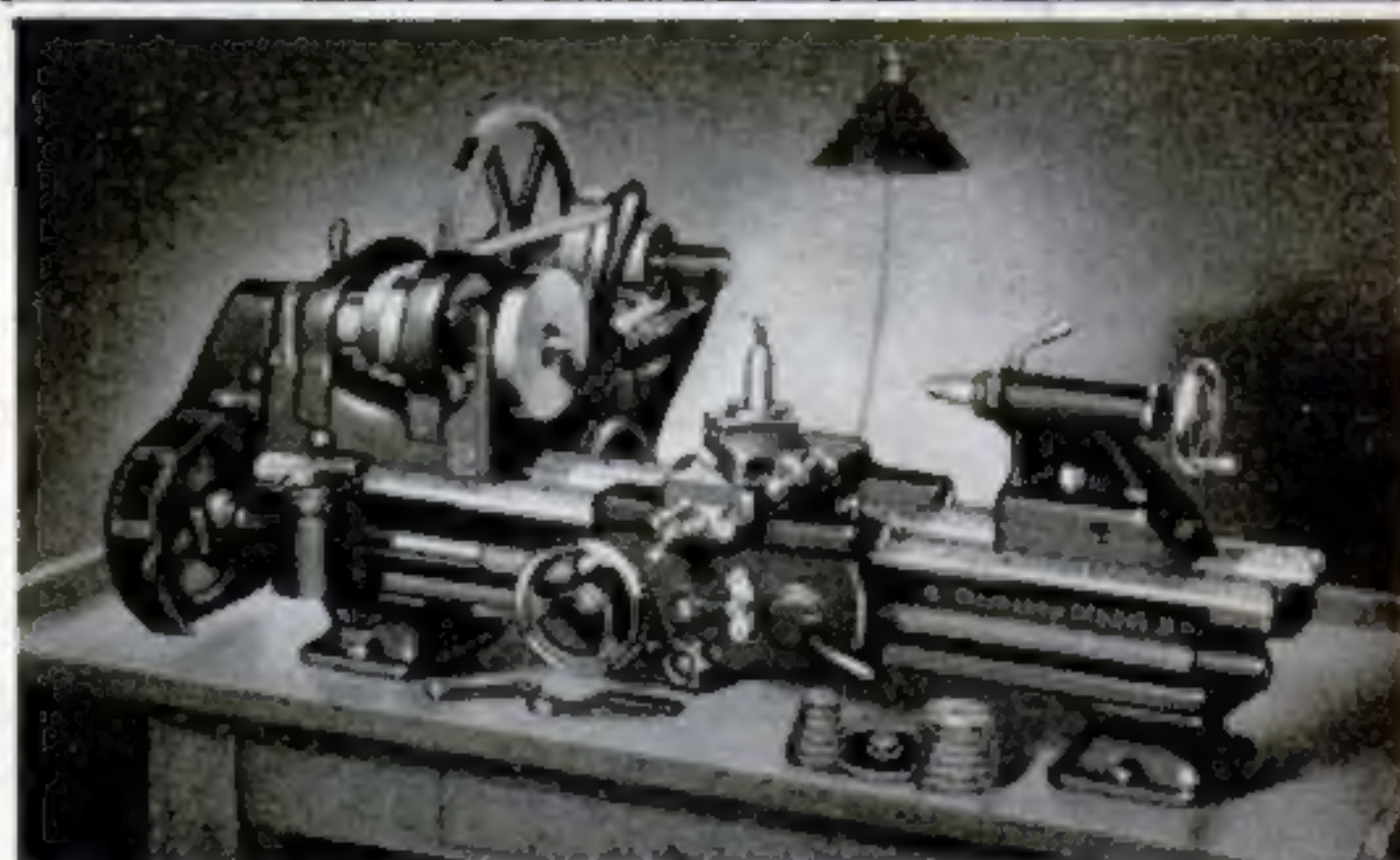
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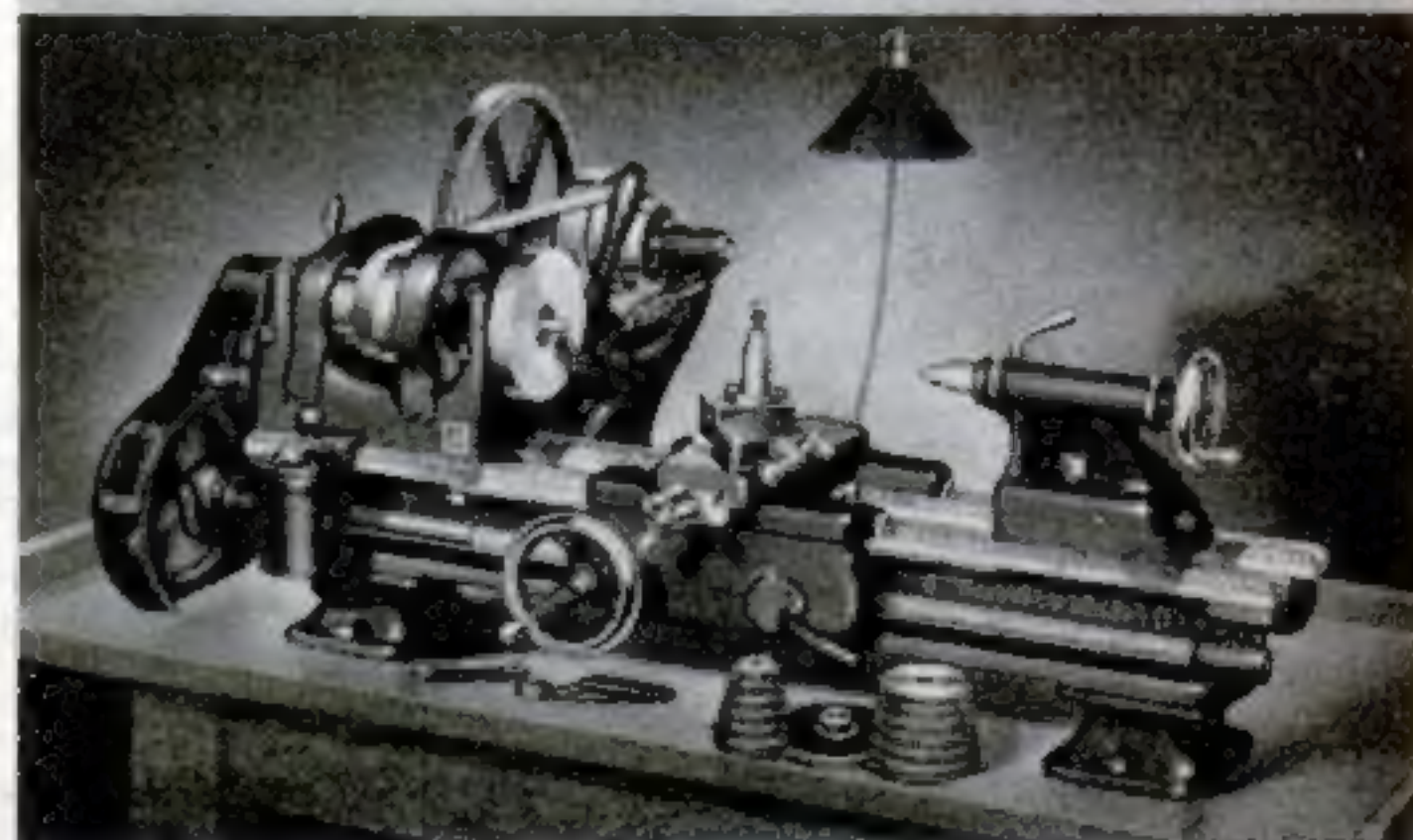
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